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1954

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AGRICULTURAL ECONOMICS RESEARCH

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Volume VI JULY 1954 Number 3

# Quarterly Estimates of Realized Gross and Net Farm Income

By Ernest W. Grove

*Realized net income of farm operators reached a postwar high of 16.8 billion dollars in 1947 and declined to a postwar low of 12.4 billion dollars in 1950. These estimates are for calendar years. On a quarterly basis, in terms of seasonally adjusted annual rates, the postwar high was 17.9 billion dollars in the first quarter of 1947, and the postwar low was 11.7 billion dollars in the second quarter of 1950. Thus, farmers' net income actually declined 35 percent during a period of a little more than 3 years as compared with a drop of only 26 percent indicated by the annual data. It is evident that the annual estimates do not measure the full swing from high to low. To overcome this handicap in the historical record of farm income, and to provide a foundation for more frequent and more up-to-date appraisal of the farm income situation in the future, this paper presents a new quarterly series on gross and net realized income of farm operators in terms of seasonally adjusted annual rates for 1929–53. These estimates will be published regularly henceforth in* The Farm Income Situation.

DESCRIPTORY

NEW ESTIMATES of realized gross and net farm income—given in detail in table 1 and summarized in figure 1—show considerably more variation than annual data, given also in table 1 for comparative purposes.

These are the first seasonally adjusted quarterly estimates of realized net farm income that have been derived by subtracting independently adjusted estimates of farm production expenses from totals of similarly adjusted estimates of individual components of realized gross farm income. This is undoubtedly the most satisfactory approach, but until recently inadequate data have presented obstacles that seemed insurmountable.

Difficulties are still involved, but we found that the methods here developed do provide a fairly reliable measure of quarterly changes in net farm income with seasonal influences eliminated. First of the methods to be described are those used in estimating production expenses, the chief stumbling block in the past; then follow methods for estimating each major component of gross farm income.

## Farm Production Expenses

The expenses of farm production are conveniently divided into current operating expenses and overhead costs. The latter include taxes, rent, mortgage interest, and depreciation. They represent about a third of total production expenses. Although payment for some of these items is due at certain fixed times in the year, they all may properly be considered as applying to the year as a whole and—in terms of seasonally adjusted annual rates—to any part of the year. There would be no serious problem, therefore, in deriving

TABLE 1.—*Realized gross and net farm income by quarters, seasonally adjusted at annual rates, 1929–58*

[In billions of dollars]

| Item | 1929 | | | | | 1930 | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Quarter | | | | Year | Quarter | | | | Year |
| | I | II | III | IV | | I | II | III | IV | |
| Cash receipts from farm marketings | 11.4 | 10.4 | 11.9 | 11.5 | 11.3 | 10.1 | 9.5 | 8.6 | 8.0 | 9.1 |
| Home consumption of farm products | 1.7 | 1.7 | 1.7 | 1.7 | 1.7 | 1.7 | 1.6 | 1.5 | 1.4 | 1.5 |
| Rental value of farm dwellings | .8 | .8 | .8 | .9 | .8 | .9 | .8 | .8 | .8 | .8 |
| Realized gross farm income | 13.9 | 12.9 | 14.4 | 14.1 | 13.8 | 12.7 | 11.9 | 10.9 | 10.2 | 11.4 |
| Farm production expenses | 7.7 | 7.8 | 7.7 | 7.6 | 7.7 | 7.4 | 7.1 | 6.9 | 6.6 | 7.0 |
| Farmers' realized net income | 6.2 | 5.1 | 6.7 | 6.5 | 6.1 | 5.3 | 4.8 | 4.0 | 3.6 | 4.4 |
| | 1931 | | | | | 1932 | | | | |
| Cash receipts from farm marketings | 7.4 | 6.9 | 5.6 | 5.6 | 6.4 | 5.6 | 4.7 | 4.3 | 4.3 | 4.7 |
| Home consumption of farm products | 1.3 | 1.3 | 1.2 | 1.2 | 1.3 | 1.1 | 1.0 | 1.0 | 1.0 | 1.0 |
| Rental value of farm dwellings | .8 | .8 | .7 | .7 | .7 | .7 | .7 | .6 | .6 | .7 |
| Realized gross farm income | 9.5 | 9.0 | 7.5 | 7.5 | 8.4 | 7.4 | 6.4 | 5.9 | 5.9 | 6.4 |
| Farm production expenses | 6.2 | 5.7 | 5.3 | 5.0 | 5.6 | 4.7 | 4.6 | 4.4 | 4.3 | 4.5 |
| Farmers' realized net income | 3.3 | 3.3 | 2.2 | 2.5 | 2.8 | 2.7 | 1.8 | 1.5 | 1.6 | 1.9 |
| | 1933 | | | | | 1934 | | | | |
| Cash receipts from farm marketings | 4.2 | 5.7 | 5.7 | 5.6 | 5.3 | 6.1 | 6.3 | 6.7 | 6.1 | 6.3 |
| Government payments to farmers | ------ | ------ | .2 | .3 | .1 | .3 | .4 | .5 | .6 | .5 |
| Home consumption of farm products | .9 | 1.0 | 1.1 | 1.1 | 1.0 | 1.1 | 1.0 | 1.1 | 1.2 | 1.1 |
| Rental value of farm dwellings | .6 | .6 | .6 | .6 | .6 | .6 | .6 | .6 | .7 | .6 |
| Realized gross farm income | 5.7 | 7.3 | 7.6 | 7.6 | 7.0 | 8.1 | 8.3 | 8.9 | 8.6 | 8.5 |
| Farm production expenses | 4.1 | 4.2 | 4.5 | 4.6 | 4.3 | 4.6 | 4.6 | 4.8 | 4.8 | 4.7 |
| Farmers' realized net income | 1.6 | 3.1 | 3.1 | 3.0 | 2.7 | 3.5 | 3.7 | 4.1 | 3.8 | 3.8 |
| | 1935 | | | | | 1936 | | | | |
| Cash receipts from farm marketings | 6.5 | 7.2 | 7.2 | 7.4 | 7.1 | 7.4 | 8.1 | 9.0 | 8.9 | 8.3 |
| Government payments to farmers | .6 | .6 | .6 | .5 | .6 | .3 | .2 | .3 | .3 | .3 |
| Home consumption of farm products | 1.3 | 1.4 | 1.3 | 1.3 | 1.3 | 1.3 | 1.3 | 1.4 | 1.5 | 1.4 |
| Rental value of farm dwellings | .6 | .6 | .6 | .6 | .6 | .6 | .6 | .6 | .7 | .6 |
| Realized gross farm income | 9.0 | 9.8 | 9.7 | 9.8 | 9.6 | 9.6 | 10.2 | 11.3 | 11.4 | 10.6 |
| Farm production expenses | 5.0 | 5.1 | 5.1 | 5.1 | 5.1 | 5.2 | 5.3 | 5.7 | 6.0 | 5.5 |
| Farmers' realized net income | 4.0 | 4.7 | 4.6 | 4.7 | 4.5 | 4.4 | 4.9 | 5.6 | 5.4 | 5.1 |
| | 1937 | | | | | 1938 | | | | |
| Cash receipts from farm marketings | 8.6 | 8.9 | 9.2 | 8.6 | 8.8 | 8.0 | 7.7 | 7.5 | 7.6 | 7.7 |
| Government payments to farmers | .4 | .4 | .3 | .3 | .4 | .3 | .4 | .5 | .6 | .4 |
| Home consumption of farm products | 1.5 | 1.5 | 1.4 | 1.2 | 1.4 | 1.3 | 1.2 | 1.3 | 1.3 | 1.3 |
| Rental value of farm dwellings | .7 | .6 | .6 | .6 | .6 | .6 | .6 | .6 | .6 | .6 |
| Realized gross farm income | 11.2 | 11.4 | 11.5 | 10.7 | 11.2 | 10.2 | 9.9 | 9.9 | 10.1 | 10.0 |
| Farm production expenses | 6.1 | 6.3 | 6.1 | 5.9 | 6.1 | 5.8 | 5.8 | 5.8 | 5.8 | 5.8 |
| Farmers' realized net income | 5.1 | 5.1 | 5.4 | 4.8 | 5.1 | 4.4 | 4.1 | 4.1 | 4.3 | 4.2 |

TABLE 1.—*Realized gross and net farm income by quarters, seasonally adjusted at annual rates, 1929–53*—Continued

[In billions of dollars]

| Item | 1939 | | | | | 1940 | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Quarter | | | | Year | Quarter | | | | Year |
| | I | II | III | IV | | I | II | III | IV | |
| Cash receipts from farm marketings | 7.9 | 7.7 | 7.6 | 8.1 | 7.8 | 8.3 | 8.1 | 8.1 | 8.8 | 8.3 |
| Government payments to farmers | .7 | .7 | .8 | .8 | .8 | .8 | .7 | .7 | .7 | .7 |
| Home consumption of farm products | 1.3 | 1.2 | 1.2 | 1.2 | 1.2 | 1.3 | 1.2 | 1.2 | 1.3 | 1.3 |
| Rental value of farm dwellings | .6 | .6 | .6 | .6 | .6 | .6 | .6 | .6 | .7 | .6 |
| Realized gross farm income | 10.5 | 10.2 | 10.2 | 10.7 | 10.4 | 11.0 | 10.6 | 10.6 | 11.5 | 10.9 |
| Farm production expenses | 6.0 | 6.1 | 6.1 | 6.4 | 6.1 | 6.6 | 6.6 | 6.6 | 6.7 | 6.6 |
| Farmers' realized net income | 4.5 | 4.1 | 4.1 | 4.3 | 4.3 | 4.4 | 4.0 | 4.0 | 4.8 | 4.3 |
| | 1941 | | | | | 1942 | | | | |
| Cash receipts from farm marketings | 9.1 | 10.7 | 12.1 | 12.4 | 11.1 | 13.4 | 14.8 | 16.3 | 17.5 | 15.5 |
| Government payments to farmers | .6 | .5 | .5 | .6 | .5 | .6 | .7 | .7 | .6 | .6 |
| Home consumption of farm products | 1.3 | 1.3 | 1.5 | 1.6 | 1.4 | 1.7 | 1.7 | 1.8 | 1.9 | 1.8 |
| Rental value of farm dwellings | .7 | .6 | .6 | .7 | .7 | .6 | .7 | .7 | .7 | .7 |
| Realized gross farm income | 11.7 | 13.1 | 14.7 | 15.3 | 13.7 | 16.3 | 17.9 | 19.5 | 20.7 | 18.6 |
| Farm production expenses | 7.0 | 7.3 | 7.9 | 8.4 | 7.6 | 9.0 | 9.5 | 10.0 | 10.5 | 9.8 |
| Farmers' realized net income | 4.7 | 5.8 | 6.8 | 6.9 | 6.1 | 7.3 | 8.4 | 9.5 | 10.2 | 8.8 |
| | 1943 | | | | | 1944 | | | | |
| Cash receipts from farm marketings | 18.1 | 19.8 | 19.6 | 19.9 | 19.4 | 20.8 | 21.0 | 19.2 | 20.5 | 20.4 |
| Government payments to farmers | .6 | .7 | .6 | .7 | .6 | .8 | .8 | .8 | .7 | .8 |
| Home consumption of farm products | 2.1 | 2.2 | 2.1 | 2.2 | 2.2 | 2.2 | 2.1 | 2.1 | 2.2 | 2.1 |
| Rental value of farm dwellings | .7 | .7 | .7 | .8 | .7 | .8 | .8 | .8 | .8 | .8 |
| Realized gross farm income | 21.5 | 23.4 | 23.0 | 23.6 | 22.9 | 24.6 | 24.7 | 22.9 | 24.2 | 24.1 |
| Farm production expenses | 11.0 | 11.3 | 11.4 | 11.7 | 11.4 | 11.9 | 12.1 | 12.2 | 12.3 | 12.1 |
| Farmers' realized net income | 10.5 | 12.1 | 11.6 | 11.9 | 11.5 | 12.7 | 12.6 | 10.7 | 11.9 | 12.0 |
| | 1945 | | | | | 1946 | | | | |
| Cash receipts from farm marketings | 21.9 | 21.5 | 20.8 | 21.3 | 21.4 | 21.7 | 22.4 | 26.1 | 28.1 | 24.6 |
| Government payments to farmers | .7 | .7 | .8 | .8 | .7 | .9 | .9 | .7 | .6 | .8 |
| Home consumption of farm products | 2.2 | 2.2 | 2.2 | 2.3 | 2.2 | 2.3 | 2.3 | 2.6 | 2.9 | 2.5 |
| Rental value of farm dwellings | .9 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.1 | 1.1 | 1.2 | 1.1 |
| Realized gross farm income | 25.7 | 25.4 | 24.8 | 25.4 | 25.3 | 25.9 | 26.7 | 30.5 | 32.8 | 29.0 |
| Farm production expenses | 12.7 | 13.0 | 13.1 | 13.4 | 13.0 | 13.8 | 14.3 | 15.3 | 15.7 | 14.8 |
| Farmers' realized net income | 13.0 | 12.4 | 11.7 | 12.0 | 12.3 | 12.1 | 12.4 | 15.2 | 17.1 | 14.2 |

TABLE 1.—*Realized gross and net farm income by quarters, seasonally adjusted at annual rates, 1929–53*—Continued

[In billions of dollars]

| Item | 1947 | | | | | 1948 | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Quarter | | | | Year | Quarter | | | | Year |
| | I | II | III | IV | | I | II | III | IV | |
| Cash receipts from farm marketings | 29.9 | 27.7 | 30.4 | 30.8 | 29.7 | 28.7 | 31.2 | 30.8 | 30.1 | 30.2 |
| Government payments to farmers | .3 | .3 | .3 | .3 | .3 | .3 | .3 | .2 | .2 | .3 |
| Home consumption of farm products | 2.7 | 2.6 | 2.7 | 2.7 | 2.7 | 2.7 | 2.6 | 2.7 | 2.5 | 2.6 |
| Rental value of farm dwellings | 1.3 | 1.3 | 1.3 | 1.4 | 1.3 | 1.4 | 1.4 | 1.4 | 1.5 | 1.4 |
| Realized gross farm income | 34.2 | 31.9 | 34.7 | 35.2 | 34.0 | 33.1 | 35.5 | 35.1 | 34.3 | 34.5 |
| Farm production expenses | 16.3 | 17.0 | 17.5 | 18.1 | 17.2 | 18.9 | 19.2 | 18.9 | 18.6 | 18.9 |
| Farmers' realized net income | 17.9 | 14.9 | 17.2 | 17.1 | 16.8 | 14.2 | 16.3 | 16.2 | 15.7 | 15.6 |
| | 1949 | | | | | 1950 | | | | |
| Cash receipts from farm marketings | 28.6 | 28.3 | 27.6 | 27.3 | 27.9 | 27.5 | 27.4 | 28.4 | 30.0 | 28.3 |
| Government payments to farmers | .2 | .2 | .2 | .2 | .2 | .2 | .3 | .3 | .3 | .3 |
| Home consumption of farm products | 2.3 | 2.2 | 2.2 | 2.0 | 2.2 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 |
| Rental value of farm dwellings | 1.5 | 1.5 | 1.4 | 1.4 | 1.5 | 1.4 | 1.4 | 1.5 | 1.5 | 1.5 |
| Realized gross farm income | 32.6 | 32.2 | 31.4 | 30.9 | 31.8 | 31.1 | 31.1 | 32.2 | 33.8 | 32.1 |
| Farm production expenses | 18.4 | 18.4 | 18.0 | 17.9 | 18.2 | 18.6 | 19.4 | 20.1 | 20.7 | 19.7 |
| Farmers' realized net income | 14.2 | 13.8 | 13.4 | 13.0 | 13.6 | 12.5 | 11.7 | 12.1 | 13.1 | 12.4 |
| | 1951 | | | | | 1952 | | | | |
| Cash receipts from farm marketings | 31.5 | 32.8 | 33.0 | 33.9 | 32.8 | 31.9 | 32.4 | 33.5 | 31.7 | 32.4 |
| Government payments to farmers | .3 | .3 | .3 | .3 | .3 | .3 | .3 | .3 | .2 | .3 |
| Home consumption of farm products | 2.2 | 2.3 | 2.2 | 2.2 | 2.2 | 2.2 | 2.2 | 2.1 | 2.1 | 2.1 |
| Rental value of farm dwellings | 1.5 | 1.6 | 1.7 | 1.7 | 1.6 | 1.7 | 1.7 | 1.7 | 1.8 | 1.7 |
| Realized gross farm income | 35.5 | 37.0 | 37.2 | 38.1 | 36.9 | 36.1 | 36.6 | 37.6 | 35.8 | 36.5 |
| Farm production expenses | 21.9 | 22.5 | 22.3 | 22.5 | 22.3 | 23.2 | 23.3 | 23.0 | 22.6 | 23.0 |
| Farmers' realized net income | 13.6 | 14.5 | 14.9 | 15.6 | 14.6 | 12.9 | 13.3 | 14.6 | 13.2 | 13.5 |
| | 1953 | | | | | | | | | |
| Cash receipts from farm marketings | 32.3 | 31.2 | 30.0 | 30.5 | 31.0 | | | | | |
| Government payments to farmers | .2 | .2 | .2 | .2 | .2 | | | | | |
| Home consumption of farm products | 2.1 | 2.1 | 2.1 | 2.0 | 2.1 | | | | | |
| Rental value of farm dwellings | 1.8 | 1.8 | 1.7 | 1.7 | 1.7 | | | | | |
| Realized gross farm income | 36.4 | 35.3 | 34.0 | 34.4 | 35.0 | | | | | |
| Farm production expenses | 22.8 | 22.2 | 22.0 | 21.9 | 22.2 | | | | | |
| Farmers' realized net income | 13.6 | 13.1 | 12.0 | 12.5 | 12.8 | | | | | |

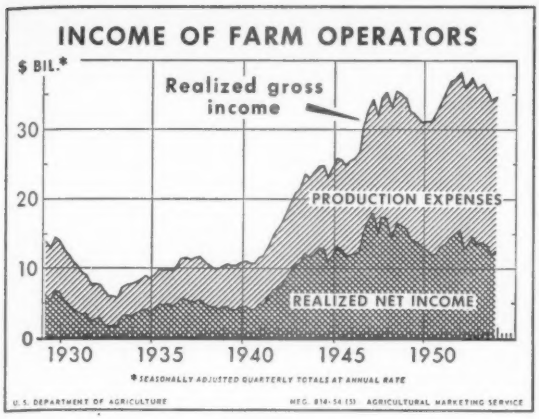


FIGURE 1.

quarterly estimates of overhead costs alone.

But current operating expenses are incurred in varying amounts throughout the year. Most of them are known to exhibit marked seasonal variations that are related in one way or another to variations in farm production itself. If actual quarterly data on operating expenses were available, the usual methods of seasonal adjustment would be appropriate. Unfortunately, such data are not available. Prices paid by farmers for the various expense items are reported monthly; but quantities can ordinarily be approximated only on an annual basis. Under the circumstances, it was necessary to lump current expenses with overhead costs and to allocate total production expenses by quarters in a manner which assumes, in effect, that they are all overhead costs.

The method relies heavily on monthly index numbers of prices paid by farmers for all production items, including interest, taxes, and wage rates, which are published currently in *Agricultural Prices*. With few exceptions, most important of which is rent, this index covers all the commodities and services included in farm production expenses, and it is suitably weighted to provide a good measure of changes in the overall price factor underlying total production expenses. Annual averages of the price index are closely correlated with total annual production expenses, not only because the latter reflect price changes, but also because the total volume of inputs usually increases with rising prices and declines with falling prices.

For this reason, fairly acceptable quarterly estimates of production expenses might have been read from the simple linear regression of total annual expenses on the annual price index, using quarterly averages of the price index for interpolation. Inputs have not, however, always moved in the same direction as the price factor. In the years 1935–40 in particular, inputs rose considerably without much change in the average of their prices.

In view of this and other shorter periods of divergent movements in the price and volume factors, a procedure somewhat more elaborate than the simple regression method seemed justified. The method actually used involved four separate steps:

(1) Quarterly and annual averages of the index of prices paid for all production items were computed from the monthly indexes available from 1937 to date. Before 1937 the index is available only as of March, June, September, and December of each year; so quarterly and annual averages were derived for the years 1926–36 on the assumption that the index for each of the 4 months applied to the preceding and following months as well. This involved some error in the Januarys because that month should reflect interest, taxes, and wage rates for the new year rather than those reflected in the preceding December index. But as the error was small, no attempt was made to remove it except in January 1933, for which a suitable adjustment was made to insure a more accurate reflection of the cyclical low point in the quarterly index.

(2) Using the annual price indexes thus computed, annual estimates of total production expenses were deflated thereby to provide a measure of annual input at constant (1910–14 average) prices.

(3) Annual changes in input were then distributed evenly by quarters as illustrated, with hypothetical data, in table 2. Since the annual inputs center on July 1, half way between the second and third quarters of each year, the usual method of quarterly allocation was to compute the difference between the annual input and the fourth-quarter input already determined for the preceding year, and to assign 40 percent of this difference as the quarterly change in input. As illustrated by years C, D, F, and G in the table, averages of the quarterly inputs so determined are equal to the annual inputs. In starting the series, of course, as in years A and B in the table, it was necessary to use 40 percent of the difference be-

TABLE 2.—*Illustrative derivation of quarterly estimates of agricultural input, using hypothetical data*

| Year and quarter | Input | | Year and quarter | Input | |
|---|---|---|---|---|---|
| | Annual | Quarterly at annual rate | | Annual | Quarterly at annual rate |
| A | 4,680 | | I | | 3,680 |
| I | | 4,640 | II | | 3,840 |
| II | | 4,600 | F | 3,920 | |
| B | 4,580 | | III | | 4,000 |
| III | | 4,560 | IV | | 4,160 |
| IV | | 4,520 | I | | 4,340 |
| I | | 4,500 | II | | 4,520 |
| II | | 4,480 | G | 4,610 | |
| C | 4,470 | | III | | 4,700 |
| III | | 4,460 | IV | | 4,880 |
| IV | | 4,440 | I | | 5,100 |
| I | | 4,260 | II | | 5,100 |
| II | | 4,080 | H | 5,100 | |
| D | 3,990 | | III | | 5,100 |
| III | | 3,900 | IV | | 5,100 |
| IV | | 3,720 | I | | 5,090 |
| I | | 3,520 | II | | 5,090 |
| II | | 3,520 | I | 5,090 | |
| E | 3,520 | | III | | 5,090 |
| III | | 3,520 | IV | | 5,090 |
| IV | | 3,520 | | | |

tween the 2 annual inputs since a fourth-quarter estimate for the first year was not available. In the actual calculations, the quarterly series was started with 1926 so that by 1929 it would be moving in the right direction.

An exception to the above rule had to be made for each year representing a turning point in annual input (years E and H in the table). The trend changed at some time during the course of the year, without any evidence as to when it actually did change. Therefore, a constant level of input throughout the year was the most reasonable assumption to make. Although this exception proved applicable only in 1932, a major cyclical turning point, it might also be necessary during a period of short-run ups and downs in annual input to avoid an unreasonable see-saw effect on the quarterly interpolations. A second exception frequently applies to the most recent year in the series (year I in the table). Until the trend of input is definitely established by later events, it may be necessary to assume a constant rate of input in all 4 quarters of the most recent year.

(4) The fourth and last step was to reinflate quarterly inputs at annual rates determined in the preceding step, using the quarterly average price indexes described in step (1), to give quarterly estimates at annual rates in current prices. Adjustments were then made for any discrepancy—usually quite small—between the 4-quarter averages of these data and the original annual estimates of production expenses.

In view of the limited information at hand, the final results shown in rounded form in table 1 are the best that could be obtained. Their trends may be somewhat smoother than would have been obtained by direct seasonal adjustment of actual quarterly estimates based on complete information. But otherwise they are a reasonable representation of quarterly changes in the total expense factor. On a current basis, before there is any definite estimate of expenses for the year as a whole, it will usually be necessary to base quarterly estimates on the price index alone, assuming that input remains unchanged from the preceding year. On the few occasions of definite evidence of a current increase or decrease in total input, the method will permit the incorporation of such changes even in current estimates.

## Cash Receipts From Farm Marketings

Because of the relative stability of farm production expenses, quarterly changes in farmers'

realized net income are largely determined by changes in their gross income. And as cash receipts from marketings are the dominant element in gross income, they should be estimated as accurately as possible in terms of seasonally adjusted annual rates. Fortunately for this purpose—and in marked contrast to the situation with respect to production expenses—complete quarterly data are available on cash receipts from marketings. In fact, data are actually available on a monthly basis in terms of quantities sold, average prices, and cash receipts for about 100 individual farm commodities by States.

This detailed information, however, represents an embarrassment of riches from the standpoint of seasonal adjustment of total cash receipts from marketings. Ideally, total cash receipts ought to be adjusted for seasonal variation in terms of separate analyses for each commodity included in the total, because the normal seasonal pattern of marketings varies tremendously among the different commodities. Moreover, the normal seasonal pattern of marketings may be different for the *same* commodity in different States, and many commodities exhibit regular seasonal variations in their monthly average prices as well as their monthly marketings. Therefore, a good theoretical case might be made for the proposition that separate seasonal analyses ought to be made for both the price and volume factors underlying cash receipts for each commodity in each State.[1]

But such a detailed analysis of seasonal variations in cash receipts is not feasible; and even if it were, there are grounds, based on past experience, for doubting its desirability when national totals of cash receipts on a seasonally adjusted basis are the only objective.

Monthly index numbers of total cash receipts from farm marketings on a seasonally adjusted basis were first published by the Bureau of Agricultural Economics in 1935. In addition, separate indexes were shown for some of the major commodity groups. They were published regularly in this form in *The Farm Income Situation* until early 1947, when they were discontinued. There were five reasons for discontinuance:

(1) The inherent instability in the seasonal pattern of marketings of individual farm commodities, of certain major crops in particular; (2) the additional erratic influence of crop loans and redemptions under the program of the Commodity Credit Corporation; (3) the fact that seasonal adjustment factors then in use were out of date, with resources lacking for their improvement on the individual commodity terms with which they had been started; (4) especially poor experience with the indexes during the months of abnormal marketings before and after price decontrol in 1946; and (5) the logical fallacy involved in the seasonal adjustment of current cash receipts which are themselves of necessity determined in part on the basis of the seasonal pattern of marketings in previous years.

An abnormal test period like 1946 may not soon recur, but the other difficulties listed above are still applicable. The logical fallacy just mentioned, however, applies only to certain of the major crops. It does not apply to cotton or tobacco, for which current information on actual monthly marketings is available, nor does it apply to any of the principal livestock commodities. It still constitutes a strong objection to the current publication of seasonally adjusted data for the crops to which it applies. But this objection probably loses some of its force in terms of seasonally adjusted *total* cash receipts—and perhaps even more if determination of the latter is merely one of several steps in the derivation of seasonally adjusted net income. In any case, this fallacy makes the use of any detailed analyses of seasonal variations rather pointless, to say the least, when applied to current data. And the other difficulties listed above suggest that detailed analyses had better be avoided on a historical basis also.

The first difficulty mentioned—the inherent instability in the seasonal pattern of most crops—was well stated in connection with the first publication of the seasonally adjusted indexes in 1935:

"It is difficult to determine what might be considered normal seasonal changes in income from crops. In many cases more than half of the crop is moved to market within a few months of harvest, and the movement of the remainder of the crop in the other 9 months is often irregular. Furthermore the harvesting season shifts to some extent from year to year with changes in weather conditions. . . . Consequently, after making adjustments for any average seasonal change, there may still remain

[1] For a discussion of some of the methods that would be applicable to such a detailed analysis, see Foote, R. J. and Fox, Karl A. SEASONAL VARIATION: METHODS OF MEASUREMENT AND TESTS OF SIGNIFICANCE. U. S. Dept. Agr. Handbook No. 48. 1952.

in any season considerable variation from this average due to *seasonal* conditions, as well as to economic conditions that are not directly related to the usual seasonal factors in the income from marketings."[2]

In other words—and to put the matter a little more strongly—there may be no such thing as a "normal" seasonal pattern of marketings for most crops, except within relatively wide limits. And unless seasonal adjustment factors were somehow computed independently for each year, to take into account erratic and presumably temporary shifts in the seasonal pattern of sales, the seasonally adjusted data would retain many sharp and meaningless fluctuations that should have been removed. This problem has been aggravated since 1938 by the loan program of the Commodity Credit Corporation.[3]

When a farmer puts a crop under CCC loan, the transaction is counted as the equivalent of a sale and the proceeds are included in cash receipts. If the farmer redeems the crop later, because its price has risen or is expected to rise enough to make such redemption worth while, repayment of the loan is deducted as an offset to cash receipts in the month in which it occurs. In crop years of heavy loans followed by similarly heavy redemption, this procedure has the effect, logical as far as it goes, of shifting a large part of what would ordinarily be spring marketings back into the second half of the preceding calendar year. But the question then arises as to whether such a shift should not be treated as a temporary change in the seasonality of the commodity in question, a change that should not be allowed to manifest itself in the seasonally adjusted data.

These matters could doubtless be dealt with in terms of seasonal adjustments for each individual commodity, to be combined into a seasonally adjusted grand total for all commodities. But to do so at all satisfactorily would require thorough historical analysis of seasonal variations for each commodity, followed by a continuous process of interpreting and policing the data to keep results up to date and applicable to current conditions.

Under the circumstances it seemed best not to attempt such detailed analyses for individual commodities, but rather to develop quarterly seasonal adjustment factors only for certain of the major totals of cash receipts. Specifically, the totals analyzed were (1) cash receipts from all crops, (2) cash receipts from all livestock and livestock products, and, as a check on these results, (3) cash receipts from all commodities taken together. Seasonal adjustment in these terms automatically assigns considerably less weight to irregular variations in the individual commodity series than would a build-up of the total on an individual commodity basis. Overall adjustments are also more manageable; and temporary abnormalities in individual series that remain troublesome despite the smaller influence they are permitted to exert on the totals can more readily be dealt with.

The original quarterly data on cash receipts are given in table 3. Though unadjusted for seasonal variation, they were adjusted wherever necessary by a constant factor for each year so as to agree with the latest revised annual total for that year. This procedure was necessary because it was not possible to go back and make detailed revisions of the monthly and quarterly estimates previously developed. Discrepancies thus allowed for are generally small. Moreover, the nature of annual revisions after the development of monthly and quarterly estimates is frequently such as to provide a new estimate of annual production or sales—but no new information on the monthly distribution of sales. Consequently, the uniform adjustments here used are not likely to have introduced any significant distortions in the seasonal patterns.

To develop seasonal adjustment factors for quarterly cash receipts, the data in table 3 were processed. Each step was carried through separately for crops, for livestock and products, and for the two combined. The 3-step process we used follows:

(1) Percentage ratios of the original quarterly data to centered 4-quarter moving totals were computed for 1924–53. The results of this first step are summarized in table 4.

(2) Another set of percentage ratios was computed in exactly the same way, except that the original quarterly data were first deflated by cor-

[2] PURVES, C. M. ESTIMATES OF CASH INCOME FROM FARM MARKETINGS, monthly, 1924–34. U. S. Dept. Agr. 1935. (Processed.) P. 8. [Emphasis supplied.]

[3] An unpublished analysis of monthly wheat marketings, prepared by James F. Cooney, Jr., showed considerable irregularity but nevertheless a fairly consistent seasonal pattern from 1924 through 1937. Beginning with 1938, however, CCC loans and redemptions introduced some general change in the pattern, together with a much greater degree of irregularity.

TABLE 3.—*Cash receipts from farm marketings, by crops and livestock, by quarters, 1924–53*

[In millions of dollars]

| Year and quarter | Total | Livestock | Crops | Year and quarter | Total | Livestock | Crops |
|---|---|---|---|---|---|---|---|
| 1924 | | | | 1935 | | | |
| I | 2,219 | 1,151 | 1,068 | I | 1,336 | 880 | 456 |
| II | 1,942 | 1,219 | 723 | II | 1,494 | 1,074 | 420 |
| III | 2,589 | 1,161 | 1,428 | III | 1,987 | 1,054 | 933 |
| IV | 3,452 | 1,277 | 2,175 | IV | 2,257 | 1,109 | 1,148 |
| 1925 | | | | 1936 | | | |
| I | 2,561 | 1,298 | 1,263 | I | 1,511 | 1,005 | 506 |
| II | 2,170 | 1,425 | 745 | II | 1,656 | 1,147 | 509 |
| III | 2,839 | 1,353 | 1,486 | III | 2,474 | 1,245 | 1,229 |
| IV | 3,451 | 1,396 | 2,055 | IV | 2,715 | 1,332 | 1,383 |
| 1926 | | | | 1937 | | | |
| I | 2,421 | 1,367 | 1,054 | I | 1,763 | 1,106 | 657 |
| II | 2,368 | 1,506 | 862 | II | 1,834 | 1,249 | 585 |
| III | 2,781 | 1,405 | 1,376 | III | 2,586 | 1,284 | 1,302 |
| IV | 2,980 | 1,401 | 1,579 | IV | 2,636 | 1,274 | 1,362 |
| 1927 | | | | 1938 | | | |
| I | 2,397 | 1,387 | 1,010 | I | 1,673 | 1,047 | 626 |
| II | 2,362 | 1,511 | 851 | II | 1,605 | 1,105 | 500 |
| III | 2,804 | 1,336 | 1,468 | III | 2,101 | 1,168 | 933 |
| IV | 3,169 | 1,369 | 1,800 | IV | 2,324 | 1,192 | 1,132 |
| 1928 | | | | 1939 | | | |
| I | 2,435 | 1,476 | 959 | I | 1,642 | 1,043 | 599 |
| II | 2,406 | 1,576 | 830 | II | 1,589 | 1,105 | 484 |
| III | 2,696 | 1,470 | 1,226 | III | 2,116 | 1,136 | 980 |
| IV | 3,451 | 1,510 | 1,941 | IV | 2,472 | 1,240 | 1,232 |
| 1929 | | | | 1940 | | | |
| I | 2,539 | 1,451 | 1,088 | I | 1,721 | 1,065 | 656 |
| II | 2,400 | 1,670 | 730 | II | 1,702 | 1,191 | 511 |
| III | 3,047 | 1,572 | 1,475 | III | 2,204 | 1,222 | 982 |
| IV | 3,313 | 1,486 | 1,827 | IV | 2,705 | 1,419 | 1,286 |
| 1930 | | | | 1941 | | | |
| I | 2,312 | 1,371 | 941 | I | 1,877 | 1,266 | 611 |
| II | 2,203 | 1,449 | 754 | II | 2,228 | 1,605 | 623 |
| III | 2,237 | 1,183 | 1,054 | III | 3,258 | 1,673 | 1,585 |
| IV | 2,298 | 1,183 | 1,115 | IV | 3,712 | 1,926 | 1,786 |
| 1931 | | | | 1942 | | | |
| I | 1,698 | 1,047 | 651 | I | 2,762 | 1,893 | 869 |
| II | 1,589 | 1,046 | 543 | II | 3,070 | 2,260 | 810 |
| III | 1,454 | 886 | 568 | III | 4,390 | 2,266 | 2,124 |
| IV | 1,628 | 858 | 770 | IV | 5,264 | 2,628 | 2,636 |
| 1932 | | | | 1943 | | | |
| I | 1,293 | 721 | 572 | I | 3,770 | 2,498 | 1,272 |
| II | 1,092 | 696 | 396 | II | 4,191 | 3,015 | 1,176 |
| III | 1,113 | 677 | 436 | III | 5,344 | 2,844 | 2,500 |
| IV | 1,237 | 657 | 580 | IV | 6,053 | 3,109 | 2,944 |
| 1933 | | | | 1944 | | | |
| I | 955 | 582 | 373 | I | 4,319 | 2,800 | 1,519 |
| II | 1,265 | 759 | 506 | II | 4,356 | 2,973 | 1,383 |
| III | 1,486 | 774 | 712 | III | 5,297 | 2,682 | 2,615 |
| IV | 1,602 | 728 | 874 | IV | 6,405 | 2,882 | 3,523 |
| 1934 | | | | 1945 | | | |
| I | 1,388 | 740 | 648 | I | 4,515 | 2,769 | 1,746 |
| II | 1,391 | 844 | 547 | II | 4,426 | 3,022 | 1,404 |
| III | 1,766 | 848 | 918 | III | 5,720 | 2,886 | 2,834 |
| IV | 1,769 | 897 | 872 | IV | 6,722 | 3,287 | 3,435 |

*Continued*

TABLE 3.—*Cash receipts from farm marketings, by crops and livestock, by quarters, 1924–53*—Continued

[In millions of dollars]

| Year and quarter | Total | Livestock | Crops | Year and quarter | Total | Livestock | Crops |
|---|---|---|---|---|---|---|---|
| 1946 | | | | 1950 | | | |
| I | 4, 415 | 2, 772 | 1, 643 | I | 5, 661 | 3, 329 | 2, 332 |
| II | 4, 458 | 2, 968 | 1, 490 | II | 5, 350 | 3, 811 | 1, 539 |
| III | 7, 053 | 3, 483 | 3, 570 | III | 7, 559 | 4, 136 | 3, 423 |
| IV | 8, 638 | 4, 507 | 4, 131 | IV | 9, 758 | 4, 700 | 5, 058 |
| 1947 | | | | 1951 | | | |
| I | 6, 094 | 3, 703 | 2, 391 | I | 6, 574 | 4, 410 | 2, 164 |
| II | 5, 687 | 3, 941 | 1, 746 | II | 6, 426 | 4, 853 | 1, 573 |
| III | 8, 302 | 4, 059 | 4, 243 | III | 8, 753 | 4, 915 | 3, 838 |
| IV | 9, 623 | 4, 773 | 4, 850 | IV | 11, 046 | 5, 434 | 5, 612 |
| 1948 | | | | 1952 | | | |
| I | 5, 941 | 3, 821 | 2, 120 | I | 6, 688 | 4, 338 | 2, 350 |
| II | 6, 394 | 4, 343 | 2, 051 | II | 6, 464 | 4, 497 | 1, 967 |
| III | 8, 376 | 4, 388 | 3, 988 | III | 8, 972 | 4, 646 | 4, 326 |
| IV | 9, 496 | 4, 519 | 4, 977 | IV | 10, 249 | 4, 873 | 5, 376 |
| 1949 | | | | 1953 | | | |
| I | 5, 882 | 3, 613 | 2, 269 | I | 6, 774 | 4, 110 | 2, 664 |
| II | 5, 774 | 3, 844 | 1, 930 | II | 6, 087 | 4, 313 | 1, 774 |
| III | 7, 588 | 3, 863 | 3, 725 | III | 8, 007 | 4, 233 | 3, 774 |
| IV | 8, 700 | 4, 039 | 4, 661 | IV | 10, 107 | 4, 522 | 5, 585 |

responding quarterly average index numbers of prices received by farmers. The results provided a rough measure of the seasonal factor in volume alone, eliminating the effect of price changes. During most of the years analyzed price changes were substantial and, in some, quite rapid; they were mainly nonseasonal in character; and their effect on the undeflated ratios of step (1) was sometimes to obscure or otherwise distort real changes in the seasonal pattern of cash receipts.

(3) Both sets of ratios were plotted on a time chart for each quarter. Their trends were noted and compared, and points or intervals of change in the ratios were marked off. Average ratios were then computed for periods of years which seemed to be homogeneous from the standpoint of the seasonal importance of the quarter under study, omitting from the averages any abnormal ratios such as those encountered in the livestock series for 1946. These averages, after any adjustments necessary to make their sum in any given year equal 100, served as seasonal adjustment factors for use in the direct translation of the original quarterly data to a seasonally adjusted annual-rate basis.

In some years, ratios computed from deflated data differed considerably from those computed from current-dollar data, but differences between their averages for similar periods of years were usually rather small. But where such differences were significant, averages based on current-dollar ratios were generally chosen as the appropriate seasonal adjustment factors. This choice was made on the ground that some commodities exhibit regular seasonal fluctuations in their prices, fluctuations that should be reflected along with those in marketings in the seasonal adjustment factors for cash receipts. Only where the current-dollar ratios were clearly distorted by rapid nonseasonal price changes were the deflated ratios given any weight. But deflated ratios proved indispensable as an aid in pin-pointing years of change in seasonal influences and in demarcating periods of homogeneity with respect to such influences.

The three average periods given in table 4 show the general nature of the changes in seasonality of cash receipts that have occurred in the last 20 years; and the average percentage ratios in the table are, of course, fair approximations of the seasonal adjustment factors actually used. They are not identical because (1) changes in the seasonal distribution of cash receipts were not as sharp nor as uniform as might be inferred from the table, (2) abnormal periods reflected in the table were excluded in calculating the seasonal factors, and (3) seasonal factors in a few cases reflect some weight assigned to ratios calculated from deflated data.

TABLE 4.—*Percentage distribution of cash receipts, by crops and livestock, and by quarters, averages 1925–52*

| Period | Quarter | | | | Year |
|---|---|---|---|---|---|
| | I | II | III | IV | |
| | TOTAL CASH RECEIPTS | | | | |
| Average: | *Percent* | *Percent* | *Percent* | *Percent* | *Percent* |
| 1925–34 | 22. 6 | 22. 2 | 25. 9 | 29. 3 | 100 |
| 1935–44 | 20. 6 | 21. 0 | 27. 6 | 30. 8 | 100 |
| 1945–52 | 20. 6 | 19. 9 | 27. 3 | 32. 2 | 100 |
| | LIVESTOCK RECEIPTS | | | | |
| 1925–34 | 24. 0 | 26. 4 | 24. 7 | 24. 9 | 100 |
| 1935–44 | 23. 1 | 25. 5 | 25. 0 | 26. 4 | 100 |
| 1945–52 | 22. 9 | 24. 4 | 25. 0 | 27. 7 | 100 |
| | CROP RECEIPTS | | | | |
| 1925–34 | 21. 0 | 17. 7 | 27. 2 | 34. 1 | 100 |
| 1935–44 | 17. 5 | 14. 8 | 31. 1 | 36. 6 | 100 |
| 1945–52 | 17. 7 | 14. 0 | 30. 2 | 38. 1 | 100 |

Data in table 4 indicate that there was considerable shift in distribution of cash receipts from the first half of the calendar year, particularly the second quarter, to the second half, particularly the fourth quarter. Except for the influence of CCC loans and redemptions mentioned earlier, the reasons for this shift are not clear; and the commodities primarily responsible for it could be isolated only through the kind of detailed commodity analyses that have previously been discussed and rejected.

When the three sets of seasonal factors had been completed, they were applied to the original quarterly data of table 3 to produce seasonally adjusted estimates on an annual-rate basis. Comparison of the independently adjusted grand totals with those resulting from the separate adjustment of the crop and livestock totals indicated differences that were generally insignificant except in 1950 and 1951. The largest differences were in the second quarters of those 2 years, when abnormally large quantities of crops were redeemed by farmers from the Commodity Credit Corporation. As previously noted, the loan repayments accompanying such redemptions are deducted as an offset to cash receipts from regular market sales at the time they are made, their net effect being a corresponding reduction in the volume of marketings implicit in the resulting estimate of cash receipts. How such abnormalities should be considered on a seasonally adjusted basis is perhaps open to argument. So far as the seasonally adjusted annual rates given in table 1 are concerned, it was decided simply to hold their effects to a minimum by using the independently adjusted grand totals for 1950 and 1951 instead of those resulting from the separate crop and livestock adjustments.

## Government Payments to Farmers

Government payments are the only component of farmers' income other than cash receipts from marketings for which complete information on a quarterly basis is actually available. But because of the erratic fluctuations encountered in this series, the usual methods of seasonal adjustment are not applicable.

Government payments generally exhibit marked seasonal variation from quarter to quarter in any one year. But the seasonal pattern varies considerably from one year to the next because of changes (1) in programs and types of payment, (2) in fiscal-year appropriations for the same program—which may have different effects on the seasonal pattern of payments in 2 successive calendar years, and (3) in the speed with which money due is actually paid out.

In view of these circumstances, quarterly estimates of Government payments given in table 1 are based directly on 4-quarter moving totals, centered, and then adjusted to actual calendar-year totals. This method removes seasonal variations from the series. An unavoidable disadvantage is that it also reduces the amplitude of nonseasonal fluctuations but this is heavily outweighed by its advantages in a case of this sort.

Another disadvantage from the standpoint of keeping estimates current is the half-year lag in the moving totals. Satisfactory projections of Government payments can be made, however, in terms of the amount of money that has been or is expected to be appropriated for this purpose. And the estimates can be kept up to date with reasonable accuracy on this basis.

## Home Consumption of Farm Products

The value of home consumption represents the annual quantities of farm products that are con-

sumed directly in farm households, with those quantities valued at prices received for the sale of similar products. We have no information as to quarterly variations in quantities so consumed, but quarterly price data are available for most of the items involved. As the situation with respect to available information in this case is analogous to that found in the case of farm production expenses, the method used for quarterly interpolation is also similar.

Annual estimates of the value of home consumption were first deflated by the index of prices received by farmers; annual changes in these deflated values were allocated evenly among the various quarters of each year as in the case of production expenses previously described; the resulting quarterly values at constant prices were then reinflated by corresponding quarterly average indexes of prices received; and, finally, these results were in turn adjusted wherever necessary to bring their calendar-year averages in line with the original annual estimates. These calculations were carried through separately for the totals of crops and of livestock and livestock products included in home consumption.

This "deflation-reinflation" method of quarterly interpolation, it should be noted, is somewhat less satisfactory in its present application than it was when applied to production expenses. There are two difficulties, both involving the suitability of the price indexes for the present purpose. In the first place, the index of prices received is weighted in terms of total quantities of the various commodities produced or sold by farmers, whereas quantities actually consumed in the farm home would be the most appropriate weights for the purpose. This defect is more serious for crops than for livestock because the crop price index does not include forest products, which are important in home consumption in the form of fuelwood, whereas it *does* include a number of other nonfood crops which do not enter into home consumption.

The second difficulty arises from seasonal variations in the price index. Although certain of its components, both crops and livestock, exhibit marked seasonal variations, and seasonally adjusted indexes for these components are available, the overall indexes are published only on an unadjusted basis. Thus, the use of these unadjusted indexes in deriving quarterly estimates of the value of home consumption unavoidably retains in the latter a small degree of seasonality in the price factor which should logically be eliminated. These two defects are noted for the record; but resultant distortions in quarterly estimates cannot be large, and are probably insignificant.

Usually no current information on changes in quantities entering into home consumption is available. Current quarterly estimates of the value of home consumption must therefore be made from changes in the price factor alone, assuming quantities unchanged from the previous year.

### Rental Value of Farm Dwellings

Lack of information as a basis for allocating the rental value of farm dwellings among the 4 quarters of a year was not a serious handicap, because of the relative stability of the series in question. The rental value of dwellings responds to broad cyclical swings, but the changes from 1 year to the next tend to be small. Such changes as do occur, moreover, exhibit fairly consistent trends rather than the erratic fluctuations characteristic of some of the other series. For this reason, quarterly estimates given in table 1 are acceptable despite the dearth of actual information on a quarterly basis.

Nothing whatever is available prior to 1942. Consequently, annual changes in the series during the years 1929–41 were simply allocated evenly among the various quarters in such a manner that the 4-quarter average for each year equaled the actual estimate for the year as a whole. Beginning with 1942, quarterly estimates were interpolated on the basis of changes in the Department's index numbers of the average value per acre of all farm real estate. This index, published only once a year previous to 1942, is now published 3 times a year, as of March 1, July 1, and November 1. As the rental value of a dwelling is closely associated with its sale value, and the sale value of a farmer's dwelling is directly related to that of his farm as a whole, the index of average total value per acre provides a fairly satisfactory basis for quarterly interpolation of the rental value of farm dwellings. It also serves in the preparation of current quarterly estimates, before an estimate for the year as a whole is available.

# Factors Affecting Prices of Apples

By Ben H. Pubols

*When a farmer decides whether or not to plant apple trees he is concerned with the long-term outlook covering the next 10 or 20 years. When he sells his apples he is concerned with the immediate outlook covering the period from 3 to 9 months after his crop is harvested. Most of the research on demand for apples has attempted to explain variations in annual average prices. It gives no indication of the long-term outlook. Nor does it give much information about probable changes in prices during the marketing season. When the apple grower decides how much to store and when to take apples out of storage he needs a more detailed analysis of the factors that affect apple prices at different periods during the year. The study here reported is an attempt to provide the kind of analysis that can be used for this purpose.*

STUDIES OF FACTORS affecting season-average prices of apples were made by Gordon Ockey in 1938 and by Karl Fox in 1951, both on the staff of the former Bureau of Agricultural Economics. Ockey found that changes in the season average price received by growers for the entire United States apple crop are determined largely by the following factors: (1) Supply of apples available for market, (2) supply of competing fruits (particularly oranges), and (3) the level of domestic demand (as indicated by income of industrial workers).[1] He also recognized foreign demand as important, but did not include it in his analysis. The study covered the years 1922–37.

In 1939, the analysis was recast and extended to include 1938.[2] In the revised study, for the measure of apple supply, figures for the commercial crop were substituted for figures for the total crop. To allow for shifts in demand, an index of nonagricultural income was substituted for an index of income of industrial workers. As in the preceding study, orange production on an apple-marketing-year basis (July–June) was taken as a measure of the supply of competing fruits. Actual figures were used in both studies. Results were similar. The 1939 study showed that for 1922–38 more than 96 percent of the annual changes in season average prices received by growers for apples were associated with annual changes in the size of the commercial apple and orange crops and in nonagricultural income.

As part of a larger study by Karl Fox in 1951, year-to-year changes in prices received by growers for apples were related to year-to-year changes in production of apples and in disposable income of domestic consumers for 1922–41.[3] Disposable income of domestic consumers was used to allow for shifts in demand for apples. The annual data for production and consumer income were first converted to a per-capita basis to eliminate the effect of changes in population. Data for all three variables were next transformed to first differences of logarithms. These first differences of annual data were then correlated, using least-squares, single-equation techniques.

This study indicated that 96 percent of the year-to-year changes in season average prices received by growers for apples during 1922–41 were associated with corresponding year-to-year changes in size of the apple crop and in amount of disposable income of domestic consumers. A 1-percent change in production was found to be related to a net change of 0.8 percent in price in the opposite direction, and a 1-percent change in disposable income in a net change of 1 percent in price in the same direction. With only two factors over a longer period and a variation in method, Fox accounted for about the same percentage (96) of the annual change in apple prices as did Ockey.

[1] See FRUIT SITUATION, August 1938. Issued quarterly by the Agricultural Marketing Service, United States Department of Agriculture.

[2] See FRUIT SITUATION, August 1939.

[3] FACTORS AFFECTING FARM INCOME, FARM PRICES, AND FOOD CONSUMPTION. Agricultural Economics Research. 3: 65–82, July 1951.

## Analyses Relating to Periods Within the Season

A more recent study, which was conducted by the author and is reported by him in this paper, extended research to include analysis of changes in price for sales during different parts of the marketing season. Economic relationships involved in this study are depicted in figure 1.

Basic data analyzed in this study are mainly those prepared and published by the United States Department of Agriculture. Prices for apples and oranges are those received by growers on the 15th of the month through all methods of sale. Figures for stocks of apples are those reported in cold storage at the end of the month. Series on both total production and commercial crop are used as measures of size of crop. For a continuous series on size, the two series on production, in terms of year-to-year change, are spliced at the year 1935, for which the percentage change in production from 1934 is nearly the same for both series. Figures on disposable personal income are in terms of annual rates, regardless of the number of months covered in a particular analysis. Except for analyses dealing with early season estimates of production, series on production, stocks, and disposable income, where used as independent factors affecting prices, are adjusted for population to allow for growth in number of people.

For the purpose of analysis, basic data in most cases were transformed to first differences of logarithms. Use of logarithms implies that relationships among the variables are proportional rather than absolute. Distortions due to trends and cycles are reduced or eliminated by use of first differences. To measure relationships among variables, the least-squares, single-equation correlation method was used. Independent variables in each of the analyses made can be assumed to be determined mainly by factors other than the dependent variable. In such cases, the single-equation approach generally can be used.

## Early Season Estimates of Production

Although qualitative information on the progress of each new apple crop becomes available during the spring months and especially in June, the first official Government forecast of the size of the crop is released about July 10, giving the indicated production based on July 1 conditions. Similar estimates are made each month during the summer and fall. Each successive estimate is based on the condition of the crop on the first of the month, together with the assumption of average weather during the remainder of the growing and harvesting season. A concluding estimate is made in December as part of the annual summary on crop production. This December figure may be revised the following July on the basis of data on utilization of the crop and other relevant information. Even these figures are subject to further revision, especially on the basis of benchmark data every 5 years from the census of agriculture.

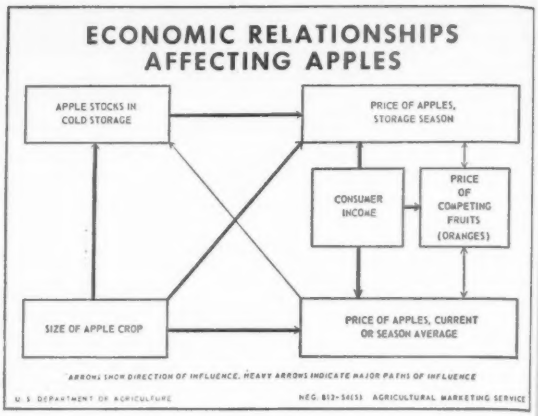
ECONOMIC RELATIONSHIPS AFFECTING APPLES
APPLE STOCKS IN COLD STORAGE
PRICE OF APPLES, STORAGE SEASON
CONSUMER INCOME
PRICE OF COMPETING FRUITS (ORANGES)
SIZE OF APPLE CROP
PRICE OF APPLES, CURRENT OR SEASON AVERAGE
ARROWS SHOW DIRECTION OF INFLUENCE. HEAVY ARROWS INDICATE MAJOR PATHS OF INFLUENCE
U. S. DEPARTMENT OF AGRICULTURE
NEG. 812-56(5) AGRICULTURAL MARKETING SERVICE

FIGURE 1.

Current early season estimates on the size of the crop tend to influence the utilization, marketing, and pricing of apples during summer and fall. Similarly, the December estimate of production and the monthly figures on stocks in cold storage become influential factors during the following winter and spring. Because each of the estimates on size of crop made early in the season assumes average weather until completion of harvest, departure from average weather will tend to make such estimates higher or lower than the December figure. Moreover, the estimate for July will tend to vary the most from December, while each successive monthly figure will tend to be closer to December.

Figure 2 depicts standard deviations of the differences between December estimates and those made in earlier months for the total apple crop, 1920–38, the commercial crop, 1940–53, and the

commercial crop, 1944–53. Estimates of total production were discontinued with the 1938 crop. Beginning with the 1939 crop, estimates were made for only the commercial crop, that is, total production of apples in the commercial apple areas of each State. In 1939, however, no early season estimates were made for the commercial crop comparable with the December estimate of that year and with early season estimates of subsequent years. Moreover, July estimates for the commercial crop were not started until 1944. Because of these changes in estimating the apple crop, standard deviations covering three situations are presented in figure 2.

Patterns of variability of estimates each month from July to December are similar for both total production and the commercial crop. July estimates tend to differ most from December estimates, and successive monthly estimates tend to be progressively closer to December figures. But estimates for the total apple crop tend to differ more widely from the December figure than do those for the commercial crop. This is probably because of the greater difficulty of estimating the size of the noncommercial part of the total crop, for which growing conditions are not so well controlled as for the commercial crop and for which check data on production are less satisfactory. But even for the commercial crop, the July estimates for 1944–53 varied from the December figures by an average of 7.5 million bushels and these differences had a standard deviation of about 9 million bushels.

By October, when harvesting in the late-producing States was well under way, estimates of the crop varied from the December figure by mean and standard deviations of less than 3 million bushels. Average year-to-year variation in the total crop for these years was 59 million bushels; in the commercial crop it was 33–35 million bushels. Thus, in years of large changes from the preceding year, even the July estimate would be likely to indicate reliably the direction of change.

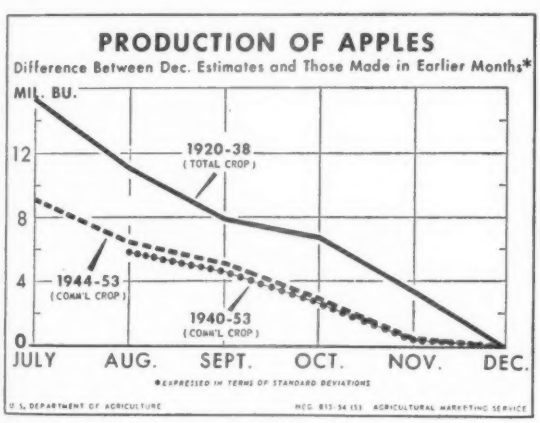


FIGURE 2.

The summer months are a critical period for the growth, sizing, and maturing of apples. Hail, winds, lack of moisture, other weather conditions, insects and diseases, may reduce the size of the crop below that in prospect on July 1. On the other hand, unusually favorable conditions may increase production. Because of departures from average of such conditions affecting production and the tendency for estimates made in summer to differ rather widely from the December estimate, use of early season estimates in forecasting prices for the crop is hazardous.

## Prices in Summer and Fall

Use of early season estimates of apple production as a factor in forecasting apple prices is risky, but persons who are concerned with the marketing of apples during summer and fall, as in other seasons, are faced with the necessity of making assumptions or estimates concerning probable future prices. June and July are transitional months during which prices of new-crop apples are influenced by the price level for old-crop apples, supplies of merchantable new-crop apples, and demand for such early apples. Moreover, during August and perhaps September, supplies of summer apples probably are more influential in determining price than is the size of the entire crop. But with the availability in October of heavy supplies of fall and winter varieties, which usually comprise about 95 percent of the crop, total production becomes a dominant factor in price.

To measure the effect of early season estimates upon price, grower prices for apples in September, October, and November, in turn, were correlated with August estimates of production and fourth-quarter disposable consumer income. Similarly, grower prices in November, December, and January were correlated with October estimates of production and fourth-quarter disposable income. For these analyses based on tentative estimates of production, no adjustments for population

TABLE 1.—*Apples: Effect on year-to-year changes in price received by growers during September–January of year-to-year changes in production and disposable consumer income, United States, 1921–53* [1]

| Item | Coefficient of determination | Value for constant "a" [2] | Effect on price of a 1-percent change in— | | | |
|---|---|---|---|---|---|---|
| | | | Production | | Disposable income (4th quarter) | |
| | | | Net effect [3] | Standard error | Net effect [3] | Standard error |
| Production estimate: | | | *Percent* | *Percent* | *Percent* | *Percent* |
| August— | | | | | | |
| Price: September | 0. 66 | −0. 010 | −0. 63 | 0. 09 | 1. 00 | 0. 26 |
| October | . 81 | −. 014 | −. 88 | . 08 | 1. 14 | . 25 |
| November | . 83 | −. 014 | −. 93 | . 08 | 1. 15 | . 24 |
| October— | | | | | | |
| Price: November | . 85 | −. 015 | −. 89 | . 07 | 1. 18 | . 23 |
| December | . 84 | −. 016 | −. 86 | . 07 | 1. 15 | . 23 |
| January | . 82 | −. 016 | −. 79 | . 07 | 1. 28 | . 23 |

[1] Excluding 1939 and 1940 because there were no production forecasts for August and October 1939.
[2] Values for the constant "a" are here given for convenience in constructing the estimating equations. For example: The equation for estimating the annual change in price in November based on the August estimate of production and 4th quarter disposable income would be: $X'_1 = -0.014 - 0.93X_2 + 1.15X_3$.
[3] Regression coefficients from analyses based on first differences of logarithms.

were made in the figures for production and income, as were made for analyses relating to the storage season for apples. Furthermore, oranges were excluded. Results of these analyses are given in table 1.

Of the six situations summarized in table 1, the first, showing results for apple prices in September related to the August production estimate and fourth-quarter income, is the least satisfactory. Annual changes in the two factors of production and income were associated with only 66 percent of the annual changes in the price for September. Moreover, the regression coefficients for production and income with prices were the lowest, and the standard errors of these two coefficients were the highest, of the six sets shown. Supplies of summer apples apparently exert considerable influence on price as late as September.

Considerably better results were achieved in the situations in which prices in October and November were related to August production estimates. In these two situations, production apparently becomes a stronger factor in price.

Further improvement in results was obtained in the situations in which October production estimates were used. Within this group, the results for prices in January were less satisfactory than those for prices in November and December. Prices in January may be more influenced by the December estimate of total production and the December 1 estimate of cold storage stocks.

Although estimates of the size of the apple crop made during the summer and fall are tentative and tend to differ from the December figure, improvement in the estimate by October is good enough to use with considerable confidence as a factor in forecasting the price of apples in November and December. Even the August estimate of production may be used to give a fairly good indication of price in October and November. From the above analyses we may infer that the most satisfactory results in using tentative estimates of production as an indicator of price during the fall may be achieved by using each successive monthly estimate of the crop, beginning with the figure for August or, possibly, September.

## Factors Related to Stocks

With the harvest of fall and winter apples in September, October, and November, there is a concurrent heavy movement of apples into storage. Net movement into cold storage has most frequently reached the peak for the season by the

end of November. With the availability of figures on December 15 each year giving the quantities of apples in cold storage on November 30 (or December 1) of the same year, these figures may be used as an alternative factor for the December production figures for estimating prices for sales from storage after the first of the year. Partly for this reason, it is of interest to obtain some idea early in the season of the probable size of stocks of apples in cold storage on December 1.

To analyze factors that might affect the quantity of apples stored each year, cold storage holdings of apples December 1 were related to size of the apple crop, price of apples during harvest, and price of apples during the preceding storage season. The December estimate of production was used to measure the size of the apple crop. For a price at harvesttime, when decisions are made on quantities to store, the average price received by growers on October 15 was used. To measure any influence of price in the preceding storage season on quantity stored in the current season, the average price received by growers during January–May of the preceding season was used.

Figures for the above-mentioned four variables for the years 1922–51, without adjustments for population, were converted to first differences of logarithms for the purpose of analysis. Separate correlations were run for the years 1922–41, 1942–51, and the two periods combined, 1922–51.

Results for 1922–41 were statistically not significant, and those for 1922–51 were not conclusive. Even for 1942–51, results were only partly satisfactory. There was little correlation between price of apples during January–May and quantity of apples stored the following season. Hence, this variable was dropped, and the correlation was re-run for apples in cold storage on December 1 as the dependent variable and size of the apple crop and price of apples October 15 as the two independent variables, for the 10 years 1942–51. Cold storage capacity has increased and has become more widely distributed in the last decade, so storage is a more influential factor in apple marketing now than previously. Statistics on quantities in storage also have improved considerably in recent years. Conditions and relationships of 1942–51 are therefore likely to be more applicable to probable quantities of apples stored during the next few years.

On the basis of the analysis as recast for 1942–51, the two factors of annual changes in size of apple crop ($X_2$) and in price of apples October 15 ($X_3$) accounted for about 87 percent of the year-to-year changes in volume of apples in cold storage December 1 ($X_1$). The results showed further that, on the average, after allowing for the effect of price of apples on October 15, a 1-percent change in size of crop was associated with a change in the same direction of 1.24 percent in volume stored. Similarly, after allowance for size of apple crop, a 1-percent change in price was associated with a change in the same direction of nearly 0.4 percent in the quantity of apples stored. The regression equation for this analysis, when all variables are expressed as first differences of logarithms, is as follows:

$$X'_1 = -0.014 + 1.24\ X_2 + 0.38\ X_3.$$
$$\qquad\qquad (0.22) \quad (0.26)$$

The numbers in parentheses indicate the standard errors of the respective regression coefficients.

The results of this study based on relationships during 1942–51 when applied to data for the 1952 crop indicate that the quantity of apples in cold storage December 1, 1952, would be 24.0 million bushels. The actual volume reported in storage was 24.9 million bushels, 4 percent larger than calculated. For the 1953 crop, the expected stocks on December 1 were 24.6 million bushels. The reported stocks were 25.3 million, or 3 percent larger than calculated.

In considering how apple prices during the storage season affect the quantity stored, it might have been anticipated that low prices would be associated with the placing of large quantities in storage and high prices with placing smaller quantities in storage. But results of the analysis indicate that prices have the opposite effect; that is, stocks change in the same direction as do prices. One explanation is as follows:

The size of production is allowed for in this analysis by a separate factor. Hence the coefficient on price reflects the effects of a change in price for any given level of production. If consumers are willing to pay relatively high prices early in the season, producers may assume that they will pay high prices later as well. This apparently causes producers to place larger quantities in storage.

If this explanation is correct, the substitution

of consumer income for price in this analysis should give results that are similar to those obtained from the analysis to which the above regression equation applies. Such an analysis was run. It was found that production and consumer income explained 84 percent of the variation in storage stocks as compared with the 87 percent explained by production and price. When income was used, however, the percentage change in stocks associated with a 1-percent change in production was reduced from 1.24 to 1.0 percent.

## Prices in Winter and Spring

Prices for apples in winter and spring may be estimated as early as fall, or even summer, on the basis of preliminary estimates of production. By mid-December the final estimate of production and the December 1 estimate of stocks in cold storage become available, the latter providing an additional base for estimating prices for most of the storage season. The way that the October estimate of production, the December estimate of production, and the December 1 figure on stocks in cold storage are associated with prices during the following January–May period is summarized in table 2.

In the analysis including the October estimate of production, annual changes in this estimate and in estimated disposable consumer income for the following January–June period were correlated with annual changes in the average price received by growers for apples during January–May. This analysis did not include the price of oranges during January–May as did the companion analyses, because of the problem of forecasting in October the probable supplies and prices of oranges after January 1.

Except for this difference, the three analyses were carried out in the same fashion. Figures on production, stocks, and income were adjusted for population growth, after which all series were converted to first differences of logarithms for purposes of analysis. Separate analyses were made for the 20 years, 1921–40, the 10 years, 1941–50, and the two periods combined.

Although the second period includes the years of World War II when price controls and other wartime measures were in effect, most factors continued to operate rather freely in response to the usual natural and economic forces. In fact, price ceilings were set at the higher levels reached after much of the wartime rise in prices had occurred.

Based on relationships during 1921–50, the two factors of production of apples as estimated October 1 and disposable income for January-June gave a good indication of the price of apples during January-May. In fact, the results were almost as good as those obtained when the December estimate of production or the December 1 figure for stocks was used.

In all three situations, the independent factors explained about three-fourths of the year-to-year variations in apple prices. But the effect of some individual factors upon price was more variable. On the average, a 1-percent change in the December estimate of production was associated with a change in the opposite direction of about 0.6 percent in price. Similarly, for the October estimate of production, the change in price associated with a 1-percent change in production was 0.7 percent, and for stocks the change in price was 0.8 percent.

The effect of income upon price in the analysis using the October production estimate was somewhat larger than in the situations involving the December estimate of production and December 1 stocks. For the latter two situations, the effects of income upon price were about the same.

The effect of price of oranges upon price of apples was relatively small. In fact, another analysis that excluded the price of oranges but used adjusted data for stocks of apples and consumer income yielded results that were nearly as good as the one in which oranges were included. In a similar analysis, price was related to stocks and income unadjusted for population. The results were about the same as those obtained from the analysis based on adjusted data.

The results of the analysis involving December 1 stocks of apples, income, and price of oranges for 1921–50 when applied to data for the 1951–52 season indicate that the price of apples for January-May would average $2.50 per bushel. The actual price was $2.51. For January–May 1953, the indicated price was $3.10. Actual price was $3.29, about 6 percent higher than calculated price.

In December, supplies of apples as a factor in price may be considered in terms of the December estimate of production, the final for the season, or the December 1 figure for cold storage holdings,

TABLE 2.—*Apples: Effect on year-to-year changes in price received by growers during January–May of year-to-year changes in production or stocks, disposable consumer income, and price of oranges, United States, 1921–50* [1]

| Period and supply factor | Coefficient of determination | Value for constant "a" [2] | Effect on price of a 1-percent change in— | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | Supply | | Disposable income | | Price of oranges | |
| | | | Net effect [3] | Standard error | Net effect [3] | Standard error | Net effect [3] | Standard error |
| 1921–40: | | | *Percent* | *Percent* | *Percent* | *Percent* | *Percent* | *Percent* |
| Production estimate: | | | | | | | | |
| October | 0. 85 | −0. 022 | −0. 70 | 0. 08 | 1. 05 | 0. 29 | | |
| December | . 89 | −. 019 | −. 63 | . 09 | . 93 | . 24 | 0. 16 | 0. 07 |
| Stocks, December 1 | . 76 | −. 004 | −1. 10 | . 30 | . 94 | . 36 | . 10 | . 13 |
| 1941–50: | | | | | | | | |
| Production estimate: | | | | | | | | |
| October | . 87 | −. 011 | −1. 35 | . 15 | 1. 04 | . 70 | | |
| December | . 63 | −. 019 | −. 66 | . 26 | 1. 17 | 1. 32 | . 33 | . 32 |
| Stocks, December 1 | . 75 | −. 026 | −. 75 | . 22 | 1. 56 | 1. 12 | . 18 | . 28 |
| 1921–50: | | | | | | | | |
| Production estimate: | | | | | | | | |
| October | . 73 | −. 018 | −. 70 | . 09 | 1. 15 | . 33 | | |
| December | . 79 | −. 016 | −. 63 | . 10 | . 99 | . 29 | . 19 | . 09 |
| Stocks, December 1 | . 74 | −. 006 | −. 81 | . 15 | . 98 | . 32 | . 19 | . 10 |

[1] Excluding 1939 and 1940 because there were no production forecasts for October 1939.
[2] Values for the constant "a" are here given for convenience in constructing estimating equations.
[3] Regression coefficients from analyses based on first differences of logarithms.

which usually is the largest for the season. From this month to the end of the storage season, attention turns to the successive monthly figures on stocks as the dominant supply factor influencing prices for the remainder of the season.

To measure the influence of stocks upon price after the first of the year, the price of apples for January through May, each month in turn, was related to stocks the first of the preceding month and to disposable consumer income for the current quarter, covering the 1941–50 crops (table 3). The analyses were limited to this period partly because of the more recent increased importance of storage in the marketing process. For purposes of analysis the series on stocks and income were adjusted for population, and all variables were

TABLE 3.—*Apples: Effect on year-to-year changes in price received by growers during January through May of year-to-year changes in stocks in cold storage and disposable consumer income, United States, 1941–50*

| Price for specified month | Coefficient of determination | Value for constant "a" [1] | Effect on price of a 1-percent change in— | | | |
|---|---|---|---|---|---|---|
| | | | Stocks, first of preceding month | | Disposable income, current quarter | |
| | | | Net effect [2] | Standard error | Net effect [2] | Standard error |
| | | | *Percent* | *Percent* | *Percent* | *Percent* |
| January | 0. 73 | −0. 022 | −0. 88 | 0. 20 | 1. 73 | 0. 89 |
| February | . 73 | −. 038 | −. 82 | . 19 | 2. 07 | . 92 |
| March | . 79 | −. 043 | −. 76 | . 15 | 2. 10 | . 82 |
| April | . 61 | −. 006 | −. 53 | . 16 | . 91 | 1. 28 |
| May | . 63 | −. 011 | −. 47 | . 14 | 1. 13 | 1. 23 |

[1] Values for the constant "a" are here given for convenience in constructing estimating equations.
[2] Regression coefficients from analyses based on first differences of logarithms.

transformed to first differences of logarithms.

According to the above analyses, year-to-year changes in stocks and income were associated with approximately three-fourths of the year-to-year changes in price for January, February, and March, and more than three-fifths for April and May. The net effect of stocks upon price was weakest during April and May. The smaller percentage effect of a 1-*percent* change in stocks on price as the season progresses reflects the smaller physical volume in storage. It is likely that a 1 million *bushel* change in stocks would have nearly the same effect on price in each month.

Stocks and income appear to be fairly good indicators of price during the winter months. But in the spring, as the marketing season for apples nears the end, these two factors, although still good, become less reliable.

### Concluding Observations

This study presents and evaluates factors and methods whereby the average price received by growers for apples during various parts of the marketing season can be estimated with considerable accuracy relatively early in the season and progressively during the season as revised or new data become available.

Much of the usefulness of estimates of apple prices over the marketing season rests upon their determination early in the season. But to make such early determinations requires the use of preliminary basic figures when they are available, or of assumptions on their size early in the season. Although the first Government forecasts on the size of the apple crop tend to differ considerably from the final estimate in December, each month they become progressively closer to the December figure. By late summer or early fall, they are stable enough to give fairly reliable estimates of apple prices in the months ahead.

Information on probable price behavior early in the season is timely and should prove helpful in making decisions on quantities to market during harvest, quantities to store, and rates of sales from storage. As final figures on production and monthly figures on stocks in cold storage become available, new estimates of prices in the months ahead can be made so as to give revised or new bases for judging the market.

It should be recognized that part of the year-to-year change in the price of apples is not accounted for by the basic factors analyzed in this study. Each new season attention needs to be given to any likely additional factors that may be important in that particular season.

# Livestock Marketing Practices in Iowa

By Emil H. Jebe and Norman V. Strand

*This is the second of two articles on a survey of cattle and hog marketing practices of Iowa livestock farmers conducted in the spring of 1952 by the Statistical Laboratory of Iowa State College in cooperation with the Iowa Crop and Livestock Reporting Service and the Agricultural Estimates Division, Agricultural Marketing Service. Part of the study was intended to evaluate the use of a new mail survey, initiated in Iowa, on farmers' marketing intentions. The earlier paper [1] gave results on the use made by farm operators of the monthly releases. This paper examines the sources of marketing information available to the same livestock farmers, and looks into some aspects of farm operators' habits and practices in marketing selected lots of livestock.*

IT WAS NOT THE PRIME OBJECTIVE of the study reported here to examine in detail how livestock farmers get their marketing information, but when pursuing inquiries about the

[1] STRAND, N. V., and JEBE, E. H., A STUDY OF LIVESTOCK MARKETING IN IOWA. Agricultural Economics Research. 6: 1–9. January 1954.

use of the mail survey releases[2] considerable information was obtained on this subject.

The questionnaire included two questions: "Do you find out, from any source at all, about hog and cattle prices that you might expect in the next 2 months?", or "about the numbers of cattle or hogs in Iowa that may come to market in the next 2 months?" If Yes was answered to these questions another question followed: "Where do you find out?" Table 1 gives a general summary of the responses to the two questions. About 20 percent reported that no effort was made to obtain information about future prices or receipts and about 80 percent reported that an effort was made to obtain it.[3]

Six noncooperators and 30 cooperators or an estimated 9.6 percent of the "livestock farms" said that they obtained price information from the monthly mail survey of the Iowa Crop and Livestock Reporting Service (table 2). This must mean that some operators translate such information into expected price effects, because this survey collects and reports only intentions to market in terms of numbers. At least this conclusion follows, if the questions were properly understood and answered as intended. Farm papers and magazines showed the highest percentage for price information with 19.0 percent, but the various public sources led with an estimated 27.4 percent in finding about expected numbers to be marketed. Considering the monthly marketing intentions report (ICLR) separately, 18 percent mentioned these releases as a source of information.[4] This figure is near the overall use of these Iowa Crop and Livestock Service reports by about 20 percent of the "livestock farmers" given in our first report on the Iowa Monthly Marketing survey.

Printed media—papers, magazines, market news letters, miscellaneous bulletins, and reports—were important sources of marketing information. Table 3 lists the number of such items coming to the operators' homes. Cooperators received a slightly larger number of printed reports, but the mean difference is of the order of sampling variation and class differences are also small.

Comparisons of those who do and those who do not get information about future prices or numbers to be marketed were extended by classifying respondents in terms of animal units on the farm.[5] The results of the comparison for the first question on obtaining information "about prices you may expect" are summarized in table 4. In the first four classes, animal units from 0 to 100, the estimated percentages, or the relative percentages of farm operators, are generally greater for the "no" group, those who do not obtain information on future prices. Conversely, the percentages are much greater in the "yes" group when animal units are above 100.

With respect to average number of animal units per farm, the overall average differences are notable. The figure 98.0 for the "yes" group is 48 percent larger than 66.3, the average animal units for the "no" group. The difference between the cooperator and noncooperator groups in animal units is not large, only 8 units. In terms of numbers of operators in the "yes" and "no" groups,

[2] Other studies have investigated certain aspects of the subject much further. For example:

1. *InFARMation, Please* and *InFARMation Please 2*, published by Wallace's Farmer and Iowa Homestead, Des Moines, Iowa, 1948 and 1952.
2. HOW DO IOWA FARMERS OBTAIN AND USE MARKET INFORMATION. Unpublished Manuscript, Iowa Agricultural Experiment Station, 1951.
3. AN EXPLANATION OF FACTORS MOTIVATING HOG FARMERS IN THEIR PRODUCTION AND MARKETING. Mimeo publication SPS–1, USDA, BAE, Washington, D. C., August 1947.

[3] These percentages, 20 and 80, are estimates for the universe of Iowa livestock farmers and not sample percentages. Similar quantities are reported at various places in this article, although the descriptive adjective "estimated" is not always inserted. The preparation of these estimates was explained on p. 5 of our first article. (Op. cit.) A typographical error occurred in the section on estimation in that article. The last sentence in the second paragraph of that section should read, "A reasonably accurate approximate procedure for combining the two samples is $y=\frac{1}{10}(4y_C+6y_{NC.})$" A mean becomes a proportion when the binominal coding 1 or 0, is used. In this article we use "average number" or "weighted percentage" to distinguish whether means or percentages are being estimated by this formula.

[4] It is to be noted that these estimated percentages have meaning only in the sense that the estimates relate to a situation in which all "livestock farmers" had been mailed the Iowa Crop and Livestock Service schedules and reports.

[5] Animal units per farm are the total number of cattle on farm in 1951 plus 0.33 times the total number of hogs on farm in 1951.

TABLE 1.—*Responses of farm operators to questions on securing information about expected prices and marketings of hogs and cattle* [1]

| Item | Secured information [2] | | | | | |
|---|---|---|---|---|---|---|
| | Yes | | | No | | |
| | Non-cooperators | Cooperators | Weighted percentage [3] | Non-cooperators | Cooperators | Weighted percentage [3] |
| | *Number* | *Number* | *Percent* | *Number* | *Number* | *Percent* |
| Prices | 62 | 120 | 61.2 | 38 | 80 | 38.8 |
| Marketings | 53 | 133 | 58.4 | 47 | 67 | 41.6 |
| No information obtained about prices or marketings | | | | 20 | 44 | [4] 20.8 |

[1] Questions: Do you find out from any sources at all, about hog and cattle prices that you might expect in the next 2 months? Or about the numbers of cattle and hogs in Iowa that may come to market in the next 2 months.

[2] The sample comprised 100 noncooperators and 200 cooperators in the monthly mail survey made by the Iowa Crop and Livestock Reporting Service.

[3] For method used in combining cooperators and noncooperators reference is made to first article. See footnotes 1 and 3 of text.

[4] Conversely, this implies that about 80 percent of farm operators had some sources of information about either future prices or future marketings (in short run, that is the next 2 months).

Agricultural Marketing Service and Iowa State College Livestock Marketing Survey, March 1952.

TABLE 2.—*Number of farm operators obtaining information on prices and marketings of hogs and cattle, by specified sources*

| Item | Secured information on— | | | | | |
|---|---|---|---|---|---|---|
| | Prices | | | Marketings | | |
| | Nonco-operators | Cooperators | Weighted percentage | Nonco-operators | Cooperators | Weighted percentage |
| Source of information: | *Number* | *Number* | *Percent* | *Number* | *Number* | *Percent* |
| Farm papers, magazines, etc. | 19 | 38 | 19.0 | 18 | 14 | 13.6 |
| Radio | 17 | 14 | 13.0 | 11 | 19 | 10.4 |
| Commercial firms and market news letters | 7 | 22 | 8.6 | 5 | 8 | 4.6 |
| Miscellaneous bulletins and reports | 4 | 0 | 2.4 | 0 | 2 | .4 |
| Local sources [1] | 3 | 5 | 2.8 | 1 | 3 | 1.2 |
| Public: | | | | | | |
| ICLR | 6 | 30 | 9.6 | 8 | 68 | 18.4 |
| Other [2] | 5 | 11 | 5.2 | 9 | 18 | 9.0 |
| Total "Yes" responses [3] | 61 | 120 | 60.6 | 52 | 132 | 57.6 |
| No Response | 1 | | | 1 | 1 | |

[1] Buyers and dealers, sales barn, marketing associations, neighbors and other farmers, night schools.

[2] Iowa State College, Extension Service, USDA, Crop and Livestock Reporting Service.

[3] These totals plus "No Response" agree with totals in table 1.

Agricultural Marketing Service and Iowa State College Livestock Marketing Survey, March 1952.

noncooperators showed no difference for the several classes of animal units, but cooperators did—as measured by the interaction $x^2$ for a two-way contingency table. Hence, the observations made on table 4 regarding numbers in the classes is largely based on the cooperator group animal unit class difference.

## Day-to-Day Prices of Hogs and Cattle

To obtain information on the sources of information used to secure day-to-day prices, those farm operators who sold an eligible lot [6] were asked, "When you were ready to sell these cattle (or hogs) how did you find out what price you could get for them?"

Selection of only one eligible lot for each respondent made the estimation problem more complicated than that presented in the first paper on this study.[7]

References to the question indicate that almost 60 percent did not sell an eligible lot of cattle in the 6-month period covered by the survey (table

[6] An eligible lot was defined as "any sale of cattle, except cows, bulls, those sold by the head and inter-farm sales" and "any sale of hogs except sows, boars, stags, those sold by the head and inter-farm sales." The term "lot," as used in this paper, may not comprise an entire sale, that is, 2 market classes of hogs, say (barrows and gilts) and (sows) going in one truck to the same buyer on the same day would be counted as 2 "lots."

[7] *Op. cit.*, p. 5.

TABLE 3.—*Number of farm operators receiving specified numbers of papers, magazines and other printed sources of livestock market information*

| Item | Noncooperator | Cooperator | Weighted percentage |
|---|---|---|---|
| Papers, magazines, etc., received: | *Number* | *Number* | *Percent* |
| None | 0 | 1 | 0.2 |
| 1–3 | 18 | 23 | 15.4 |
| 4–6 | 46 | 95 | 46.6 |
| 7–9 | 28 | 62 | 29.2 |
| 10 or more | 8 | 19 | 8.6 |
| Total operators | 100 | 200 | 100 |
| Average number of papers, magazines, etc., received | 5.72 | 6.15 | |

Agricultural Marketing Service and Iowa State College Livestock Marketing Survey, March 1952.

TABLE 4.—*Classification of farm operators by response to question on securing information on expected prices of cattle and hogs and by animal units on the farm* [1]

| Item | Secure information: Yes — Weighted percentage of— All farm operators | Yes — Weighted percentage of— All securing information | Yes — Average animal units per farm | No — Weighted percentage of— All farm operators | No — Weighted percentage of— All not securing information | No — Average animal units per farm | Average animal units per farm |
|---|---|---|---|---|---|---|---|
| Animal units per farm: | *Percent* | *Percent* | *Number* | *Percent* | *Percent* | *Number* | *Number* |
| 0 | 0.8 | 1.3 | 0 | 0.2 | 0.5 | 0 | |
| 1–20 | 4.8 | 7.8 | 11.0 | 4.4 | 11.3 | 12.6 | |
| 21–50 | 12.8 | 20.9 | 38.8 | 12.2 | 31.5 | 36.5 | |
| 51–100 | 21.6 | 35.3 | 74.4 | 14.6 | 37.6 | 71.9 | |
| 101–200 | 15.6 | 25.5 | 138.7 | 7.0 | 18.1 | 133.5 | |
| Over 200 | 5.6 | 9.2 | 297.9 | 0.4 | 1.0 | [2] 225.0 | |
| Total or average [3] | 61.2 | 100.0 | 98.0 | 38.8 | 100.0 | 66.3 | |
| Cooperators | | | 105.7 | | | 68.5 | 90.8 |
| Noncooperators | | | 92.9 | | | 64.8 | 82.2 |

[1] Question: Do you find out about hog and cattle prices you may expect in the next 2 months?

[2] Estimated since the cell for the noncooperators was empty.

[3] For these totals in terms of numbers of farm operators refer to table 1.

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TABLE 5.—*Response of farm operators to question on securing prices of hogs and cattle when ready to sell, for operators selling eligible lots* [1]

| Item | Secured information on prices of— | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Cattle | | | | Hogs | | | |
| | Non-cooperators | Cooperators | Weighted percentage of | | Non-cooperators | Cooperators | Weighted percentage of | |
| | | | All operators [2] | Lots [3] | | | All operators [2] | Lots [3] |
| Sold eligible lot: | | | | | | | | |
| Response: | *Number* | *Number* | *Percent* | *Percent* | *Number* | *Number* | *Percent* | *Percent* |
| Yes [4] | 18 | 53 | -------- | 53.4 | 70 | 152 | -------- | 87.9 |
| No [5] | 18 | 41 | -------- | 45.8 | 16 | 24 | -------- | 12.1 |
| No response | 0 | 1 | -------- | .8 | 0 | 0 | -------- | -------- |
| Total | -------- | -------- | 40.6 | 100.0 | -------- | -------- | 86.8 | 100.0 |
| Did not sell eligible lot | 64 | 105 | 59.4 | -------- | 14 | 24 | 13.2 | -------- |
| Total | 100 | 200 | 100.0 | -------- | 100 | 200 | 100.0 | -------- |

[1] Question: When you were ready to sell these cattle (hogs), did you find out what price you could get for them?

[2] Weighted by numbers of eligible lots sold by those answering "yes" or "no."

[3] The details of obtaining these estimated percentages based on weighting by numbers of eligible lots sold by each respondent are given at the end of this paper. See A Note on Estimation, p. 92.

[4] Operator obtained information from sources listed in table 6.

[5] Operator did not obtain such information just before the sale.

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5), but only 13.2 percent did not sell an eligible lot of hogs. For a little more than 50 percent of the eligible sales of cattle, and for almost 90 percent of the eligible sales of hogs, the operators did find out what price they could get. The lower percentage for cattle is explained in part by the fact that definitions of an "eligible lot" of cattle included many miscellaneous types of sales, including veal calves.

Evidences of differences in sources of price information between hog and cattle sales on the eligible lots may be seen in table 6. The "salesbarn" was mentioned more often as a source for cattle price information. This indicates again the influence of miscellaneous sales of calves, feeders, and "warmed up" stock; fed cattle, particularly finished cattle, are seldom sold at a salebarn. Contacts with buyers and commission firms were, relatively, twice as important for hogs as for cattle—52.4 percent vs. 25.9 percent. Combination responses of the type "buyers and radio" were not mentioned at all as a source of information for prices of cattle.

For day-to-day prices of livestock, radio generally appears as a stronger source of information than the printed media; in the area of future prices and receipts newspapers and magazines were mentioned more frequently.

## Specific Sources of Marketing Information

A special section of the schedule was set up to collect information on specific sources of market information. Discussion of the data collected may be conveniently divided into these sources: (1) Neighbors, (2) dealers and buyers, (3) radio market news, and (4) printed sources. Emphasis was mainly on where marketing information was or could be obtained, rather than on specifically what was obtained or what action was taken.

NEIGHBORS.—First, respondents were asked, "Do you talk to any of your neighbors about the condition of the market and when it is a good time to sell your cattle and hogs?" From the results it is

TABLE 6.—*Number and percentage of distribution of eligible lots of hogs and cattle sold, by source of price information* [1]

| Item | Cattle sold | | | | | Hogs sold | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Noncooperator | | Cooperator | | Percentage distribution of total lots | Noncooperator | | Cooperator | | Percentage distribution of total lots |
| | Lots | Percentage distribution of lots | Lots | Percentage distribution of lots | | Lots | Percentage distribution of lots | Lots | Percentage distribution of lots | |
| | *Number* | *Percent* | *Number* | *Percent* | *Percent* | *Number* | *Percent* | *Number* | *Percent* | *Percent* |
| Source of information used: | | | | | | | | | | |
| Radio and paper | 7 | 11. 86 | 15 | 10. 34 | 11. 2 | 37 | 16. 52 | 111 | 25. 00 | 19. 9 |
| Newspaper | 3 | 5. 08 | 7 | 4. 83 | 5. 0 | 6 | 2. 68 | 10 | 2. 25 | 2. 5 |
| Salesbarn | 7 | 11. 86 | 13 | 8. 97 | 10. 7 | 0 | 0 | 10 | 2. 25 | . 9 |
| Contacts with buyers and commission firms | 13 | 22. 03 | 46 | 31. 72 | 25. 9 | 130 | 58. 04 | 195 | 43. 92 | 52. 4 |
| Buyers and radio | 0 | 0 | 0 | 0 | 0 | 19 | 8. 48 | 55 | 12. 39 | 10. 0 |
| Miscellaneous | 0 | 0 | 2 | 1. 38 | . 6 | 7 | 3. 12 | 3 | . 67 | 2. 1 |
| Total | 30 | 50. 85 | 83 | 57. 24 | 53. 4 | 199 | 88. 84 | 384 | 86. 49 | 87. 9 |
| Operators who did not secure information | 29 | 49. 15 | 59 | 40. 69 | 45. 8 | 25 | 11. 16 | 60 | 13. 51 | 12. 1 |
| No response | 0 | | 3 | 2. 07 | . 8 | 0 | | | | |
| Total | 59 | 100 | 145 | 100 | 100 | 224 | 100 | 444 | 100 | 100 |

[1] Question: When you were ready to sell these cattle (hogs), how did you find out what price you could get for them.

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estimated that 33.2 percent do not talk to their neighbors about such marketing subjects. Those who responded affirmatively were asked, "Do visits with neighbors help you in deciding when and where to market your cattle and hogs?" Replies yielded these estimates:

Yes, 38.8 percent; no, 25.2 percent; don't know 2.8 percent.

The "yes" respondents were further queried, "In what way do you think they (these visits) help you?"

Response categories were paraphrased from the various originals to indicate the sense of the reply (table 7). The first three categories and numbers 7 and 8 seemed to be the most informative and definitive in explaining how visits with neighbors help in marketing decisions. These comprise about 25 percent in total, or nearly 65 percent relatively of the "yes" responses.

DEALERS AND BUYERS.—Here again the first question asked whether information was obtained from "dealers or buyers on the condition of the market

TABLE 7.—*How visits with neighbors help in making marketing decisions*

| Response | Weighted percentage of | |
|---|---|---|
| | Total responses | "Yes" responses |
| | *Percent* | *Percent* |
| Neighbors who have visited central markets are usually well informed | 2. 8 | 7. 2 |
| Experienced neighbors can give valuable advice | 5. 0 | 12. 9 |
| We compare price quotations, prices received and weights | 10. 2 | 26. 3 |
| We share our experiences | 4. 6 | 11. 8 |
| We talk "things" over | 2. 2 | 5. 7 |
| I discuss, but make my own decisions | 5. 0 | 12. 9 |
| Neighbors may have information you have not heard about | 5. 2 | 13. 4 |
| When neighbors' views or opinions agree, I follow them | 1. 4 | 3. 6 |
| Vague or don't know | 2. 4 | 6. 2 |
| Total (visits with neighbors are helpful) | 38. 8 | 100. 0 |

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TABLE 8.—*Kinds of marketing information received from dealers and buyers*

| Response | Weighted percentage of | |
|---|---|---|
| | Total responses | "Yes" responses |
| Nonlocal sources: | *Percent* | *Percent* |
| Current prices and receipts | 17. 6 | 38. 9 |
| Expected or future prices and/or receipts | 4. 2 | 9. 3 |
| Advice on when to sell | . 4 | . 9 |
| Representative comes to farm, looks at stock, gives advice on prices, weights, feeding, when to sell | 1. 4 | 3. 1 |
| Local buyers and dealers: | | |
| Current prices and receipts | 5. 8 | 12. 8 |
| Future prices and/or receipts | 6. 0 | 13. 3 |
| Information helps in planning (how not given) | 1. 0 | 2. 2 |
| Advice on when to sell | 3. 2 | 7. 1 |
| Buyers and dealers look at livestock and give advice on selling, feeding, etc | . 4 | . 9 |
| Sales barn markets | 1. 2 | 2. 7 |
| Indefinite responses | 3. 4 | 7. 5 |
| Nonresponse | . 6 | 1. 3 |
| Total | 45. 2 | 100. 0 |

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and when it is a good time to sell?" An estimated 45.2 percent indicated that some information of this type was received. Then respondents were asked, "What information do you get from dealers and buyers?" The terms "dealers" and "buyers" were not always interpreted as intended. The question was intended to relate to strictly *local* persons—not commission firms, interior markets, or interior packers. We tried to divide responses into the nonlocal and the local sources. On this basis, those who received the information were almost equally divided between local and nonlocal sources (table 8).

After ascertaining the kind of information the respondents received, our enumerators asked, "Do you use this information in any way in deciding when or where to sell your stock?" "Yes" was indicated by an estimated 30.8 percent. This group was then asked, "How do you use it?" and the "No" group was asked, "Could you tell me why you don't use it?" Relatively, none of the estimated percentages was large. To obtain satisfactory information on this subject the sample would have needed to be considerably larger.

RADIO LISTENING HABITS FOR MARKET NEWS.—All but one of the 300 members of the sample possessed a radio. Nearly all listened to radio market reports, as indicated by responses to the question, "Do you listen to radio markets on cattle and hogs?" Results show that only an estimated 1.4 percent of "livestock farmers" do not use the radio as a source of livestock marketing information.

Following the above question three others were asked, (1) "What are your listening habits just before marketing?" (2) "What are your listening habits throughout the year?" and (3) "Do you change your listening to livestock markets just before you plan to sell hogs or cattle?" If yes, "in what way?"

The third question gave some difficulty in enumeration; from many respondents it tended to elicit the same response as the first. Responses to the three questions were classified under 28 headings. More than half of the classes set up were used for all three questions, as many respondents gave similar responses to two or more of the questions.

An estimated 90 percent indicated regular radio listening for markets before selling.[8] For listening habits throughout the year, 70 percent were estimated as regular listeners. About 4 percent indicated that they listen *only* when they have stock to sell. Even though 70 percent indicated regular listening, 67 percent gave some indication of change in listening habits just before marketing.

Most often this change could be classed as listening "more closely," "pay more attention," "try not to miss markets," "listen oftener (more times a day)," "listen to more stations," "securing the early or morning markets instead of the noon reports (often markets listened to at noon just came with news)," and "listening to a specified station."

Conversely, some 31 percent indicated no change in listening before marketing. This class might be construed to be a group that follows market reports closely most of the time. A few said they now depended on TV market reports, particularly for listening throughout the year.

[8] Estimates are based upon combination of similar responses from the 28 classes used in coding the data.

## Use of Information in Marketing Operations

To assess the use made of information in marketing operations, appraisal was made of sales of eligible and selected lots of hogs and cattle. For each operator who sold an eligible lot, one lot of cattle and one lot of hogs from all the eligible lots sold by each operator were selected at random.

The first question about the sale of a selected lot of hogs or cattle was, "Why did you sell this lot of cattle (or hogs) at that time?" Many reasons were assigned for sales. Responses based on the use of marketing information were separated from the rest. An estimated weighted percentage of eligible lots which was computed indicates the percentage of eligible lots sold in the class described as giving a response related to use of marketing information. Table 9 gives a summary of the first question in this way. This and the following tables show the percentage of all respondents that sold eligible lots.

The relative percentages 12.2 and 32.7 are not to be interpreted as maximum usage of marketing information in the selling of livestock by respondents. The figures might better be interpreted as minima. Here, and in the tables that follow in this section, we are merely reporting a classification of the responses to this one of the set of questions.

TABLE 9.—*Distribution of responses indicating use of marketing information in the sale of cattle and hogs* [1]

| Classification | Cattle | | Hogs | |
|---|---|---|---|---|
| | Weighted percentage of | | Weighted percentage of | |
| | Eligible lots | All respondents | Eligible lots | All respondents |
| | *Percent* | *Percent* | *Percent* | *Percent* |
| Sold eligible lot | ------- | 40. 6 | ------- | 86. 8 |
| Reason indicated use of marketing information | 12. 2 | ------- | 32. 7 | ------- |
| Other reasons | 87. 8 | ------- | 67. 3 | ------- |

[1] Question: Why did you sell this lot of cattle (or hogs) at that time?

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TABLE 10.—*Percentage distribution of responses regarding plans for marketing and use of marketing information*

| Classification | Cattle | | Hogs | |
|---|---|---|---|---|
| | Weighted percentage of— | | Weighted percentage of— | |
| | Lots | Operators | Lots | Operators |
| Sold eligible lots | ------- | 40. 6 | ------- | 86. 8 |
| No change in plan | 80. 9 | ------- | 54. 0 | ------- |
| Changed plan: | | | | |
| Reason based on marketing information | 6. 6 | ------- | 29. 0 | ------- |
| Other reasons given | 12. 5 | ------- | 17. 0 | ------- |
| Total changed plan | 19. 1 | ------- | 46. 0 | ------- |
| Total | 100. 0 | ------- | 100. 0 | ------- |

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Table 10 brings out again a point already made. Comparing the relative percentages 12.2 and 32.7, marketing information appears to be used much more for hog sales. The definition of an eligible lot for cattle included veal calves and many other miscellaneous types of cattle sales, such as odd calves or yearlings sold at a salesbarn. Operators selling such lots would be likely to give little attention to marketing information.

A following question was, "Had you planned to sell these cattle (or hogs) earlier or later than you actually did?" If a change in plans was indicated, the following question was asked, "What was it that changed your plans?" Table 11 reports our estimates for these two questions.

Among lots for which respondents had changed plans, a much greater weighted relative percentage indicated use of marketing information. Comparing tables 9 and 10—12.2 for cattle and 32.7 for hogs with 6.6 for cattle and 29.0 for hogs, relatively—hogs again show a much greater percentage than cattle.

Another pair of questions that provided some information on the use of marketing information read, "As you look back on this sale do you think you could have made more money by selling earlier or later?" and (if yes or no), "Why do (don't) you think so?" Estimates based on the responses

TABLE 11.—*Percentage distribution of responses on selling earlier or later and reasons why operator could or could not have made more money* [1]

| Classification | Cattle | | Hogs | |
|---|---|---|---|---|
| | Weighted percentage of— | | Weighted percentage of— | |
| | Eligible lot | All respondents | Eligible lot | All respondents |
| | *Percent* | *Percent* | *Percent* | *Percent* |
| Sold eligible lot | ------- | 40.6 | ------- | 86.8 |
| Could not have made more money by selling earlier or later | 55.8 | ------- | 41.5 | ------- |
| Could have made more money by selling earlier or later | 29.9 | ------- | 49.2 | ------- |
| No response | 14.3 | ------- | 9.3 | ------- |
| Reason given as to why operator could or could not have made more money: | | | | |
| Based on marketing information | 49.8 | ------- | 74.3 | ------- |
| Other reasons | 50.2 | ------- | 17.7 | ------- |
| Inapplicable and no response | ------- | ------- | 8.0 | ------- |

[1] Questions: As you look back on this sale do you think you could have made more money by selling earlier or later? and (if yes or no) Why do (don't) you think so?

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to this combination of questions are given in table 11.

Somewhat larger relative percentages of lots were estimated in the category indicating use of market information, 49.8 and 74.3 versus the 6.6 and 29.0, given in table 10. The trend of livestock market prices in the inquiry period, September 1951—March 1952, was such that most of this group indicated that greater returns could have been obtained by selling earlier; a few gave the "later" response. In comparison with other questions, these questions on monetary returns elicited larger percentages in terms of lots for which reasons were given that showed knowledge of marketing information for the inquiry period. Of course, this information could have been obtained by means other than those reported. Yet it appears rather significant that, relatively, 50 percent for cattle and 75 percent for hogs gave reasons for securing greater returns at some other time of marketing that could be related to the use of marketing information received by them.

From the economic viewpoint also these responses are of great interest. Many farmers apparently believed that they did not maximize the returns for the resources used in livestock production in this period. This would seem to indicate a need not only for better dissemination of marketing information but also for dependable and timely estimates of future marketings.

## A Note on Estimation

Attention was directed in the text to some further complexities in estimation arising in table 5. The estimation given there is based on the number of eligible lots of cattle or hogs sold by the respondent. The complication arises in this manner:

Using table 5 as an example, suppose one noncooperator who sold one eligible lot of cattle reports, "yes"—he did find out what price he could get—while another noncooperator who sold five eligible lots also answers "yes" to the same question. In the latter case we do not know what he did in selling the other four lots. We have merely made an unbiased selection of one lot. Clearly, this lot should have a weight of five in estimating what proportion of eligible lots were priced before the sale.

But the data for our noncooperator and cooperator groups must be combined to obtain a combined relative percentage. This we illustrate in table 6. Total eligible lots of cattle sold were 59 (column 1, table 6). The noncooperators who reported that they secured their information from the radio and newspapers sold a total of 7 lots. Hence, the relative percentage $= 11.86 = (7/59)\,100$. Similarly, we obtain $10.34 = (15/145)\,100$ for the cooperator group who reported using the radio and newspapers. From our previous work on estimation we found that the weights 6/10 and 4/10, respectively, for the noncooperator and cooperator groups could be used for combining means or percentages. Thus, we secure the total relative percentage shown as $11.2 = (0.6)\,(11.86) + (0.4)\,(10.34)$ in column 5, table 6. Similar weighted percentages of lots are shown in table 5 and later tables.

# An Economical Source of Research Data

By Norris T. Pritchard and Robert E. Olson

*Collection of data for economics studies frequently is a time-consuming and expensive process. This is particularly true of studies of plants that process and distribute agricultural products. During the last 2 years the Agricultural Marketing Service has been experimenting with a low-cost method of collecting data on the operations of more than 60 independent milk-distributing companies. The Service has now had enough experience with the method to permit a critical evaluation of it. In the accompanying paper the primary purpose of the authors is to present such an evaluation. They point out advantages and limitations of the method from the viewpoint of researchers who are actively engaged in analysis of data obtained by the procedure.*

ABOUT 2 YEARS AGO the United States Department of Agriculture contracted with a private firm of accounting consultants to furnish reports on the operations of a selected group of fluid milk distributing companies. These companies are clients of the accounting firm, which operates a cost-comparison service and an accounting consulting service for independent milk companies. The principal purpose of these services is to help managers of the client companies to increase the efficiency of their operations through better management and accounting controls and through comparison of operating costs with those of other companies. Basic to achievement of this objective is a uniform accounting procedure for all companies in the cost-comparison service. The accounting firm tries to achieve this uniformity by establishing the same ledger accounts, definitions of accounts, and cost allocation procedures in each company. Many of the companies had to make many changes in their accounting methods on entry into the service.

Another essential feature of the cost-comparison service is regular quarterly reporting by the companies on their operations. These reports to the accounting firm are prepared by the accountants of the client companies on standard forms in accordance with a uniform manual of instructions.

Photostats of these quarterly reports are made by the accounting firm for the Department of Agriculture for analysis in a study of margins, costs, and efficiency of fluid milk processing and distribution. Each photostat is identified by a code number which reveals to us only the city in which the unnamed distributor is located.

Under the terms of our contract, the accounting firm selects its clients and, therefore, the reports it sends to the Department. But the firm is required to submit a specified number of reports on plants in each of three sales-volume groups. It is obligated also to supply reports on as accurate a cross-section of independent milk distributors with respect to location and size of home city as it can in securing clients in the major geographic regions in which it operates. At present we are satisfied that these requirements have been met reasonably well for the North Central and Southern regions.

This selection of plants does not, of course, provide a representative sample of the industry in the statistical sense. It, therefore, effectively prohibits certain types of statistical inferences to the universe of milk distributors. But data in the plant reports are well suited for analysis of costs and efficiency in plants of the types included in the sample. From this standpoint, the reports are analogous to individual farm-accounting records long used in farm-management research and to records of plant operations obtained by traditional methods of personal observation and interview.

## Contents of Reports

Each quarterly report contains much detailed information on the operations of the reporting companies. Properly prepared reports omit few facts of major importance. Dollar expenditures

for all inputs and outputs are reported in total and for operating cost centers, and corresponding data in physical units are reported for many inputs and outputs.

One section of the report provides a complete breakdown of sales in physical units by products, by types and sizes of containers, and by method of sale. In addition, beginning and ending inventories in physical units and the gross value of sales of each product by container size and type are reported.

Another section provides data on operating expenses. These are broken down into 12 major groups of accounts and 62 ledger accounts. The total in each ledger account is allocated to one or more cost centers in accordance with the manual provided by the accounting firm. A typical plant allocates expenses among 7 cost centers, but a few large, diversified companies have as many as 15 cost centers.

Other sections of the quarterly reports supply data on inputs of milk and cream, other ingredients used in processing, and finished products purchased for resale. Purchase prices of milk, selling prices of principal fluid milk products, use of labor by cost centers, numbers of delivery routes and route mileage by types of routes and numbers of customers per route are also reported.

## Merits of the Method

The principal advantage of this method of collecting research data is its low cost. The cost of obtaining similar data from the same or similar 60-odd companies by the more common procedures of personal interview and observation probably would exceed present costs several times. Reports received by the Department are byproducts of another operation—the cost-comparison service of the accounting firm. That is why the cost of this data-collection method to the Department is low in relation to costs of alternative methods. Fees from clients for this and other services constitute the firm's principal revenues and the contract with the Department provides only supplementary, or marginal income. Therefore the cost of the reports to the Department definitely need not, and should not, be the full cost of their preparation and collection.

A second merit of the method is that it provides data currently for a series of operating periods. The present contract between the Department and the accounting firm has a duration of 3½ years, and its expiration about a year from now does not preclude the possibility of negotiation of a new contract to take its place. Reports are received by the Department, under the terms of the contract, about 2 months following the close of the calendar quarter they cover. In contrast, alternative methods of collecting similar data usually cannot be so current nor are they well suited to obtaining data over a series of operating periods. They cannot, therefore, provide adequate information on the dynamics of plant operations.

A third advantage of the method is the high degree of uniformity among distributors in methods of accounting and reporting. Reporting companies use the same accounting manual, account definitions, and cost allocation procedures. Except for minor variations noted below, the essential meaning of the data is the same for every report. The resulting comparability of data is likely to be greater than a researcher can achieve in a survey of plants, because each company records the facts of its operations from start to finish in essentially the same manner. Moreover, in using the method, a researcher is not forced to try to adapt various accounting procedures to the one he has selected for use in his analysis.

Another advantage of the method is the comprehensiveness and accuracy of the data in the reports. It is in the interest of each client company to report on its operations both accurately and fully. Only in this way can a company obtain maximum benefits available to it from the cost-comparison service for which it pays a fee, and spends time and effort on the quarterly reports. Self-interest does not usually operate in favor of a researcher in collecting data from private companies by other techniques. Comprehensiveness and accuracy of reported data are augmented further by the standard report form which has been so designed as to facilitate and promote both accuracy and detail in reporting.

## Limitations of the Method

Like most research techniques the data-collection method under review has limitations as well as merits. Some of the deficiencies appear to be important; others probably are not serious. Several can be remedied without difficulty or much

expense while others appear, at the moment, less amenable to correction.

Inadequacy of data on the physical attributes of the plants is the most obvious, and perhaps the most important omission in the quarterly reports for a study of the efficiency of milk distributing companies. Little data regarding the structure of the plant or the nature of its equipment are reported, although a few estimates can be made from other data in the reports. Values of plant and equipment are not reported, and rates of depreciation and taxation are omitted. Such omissions effectively prevent measurements of plant capacity, rates of turnover of capital investment, and a few other factors of importance to analyses of comparative efficiencies of plants of different types and sizes. The reports also omit a few other useful, but less important, facts. But these omissions are correctible. Furthermore, alternative methods of collecting data on plant operations may also have important errors of omission, especially when inadequately financed or when used by inadequately trained persons.

Another limitation stems from the fact that a researcher analyzing plant reports is not personally acquainted with the plants or their personnel. Researchers generally are agreed that even limited personal observation of a plant in operation helps in understanding how the statistics on its operations were generated. This, in turn, facilitates analysis, especially of those aspects of the operations for which relatively simple arithmetical and statistical techniques are not adequate.

A brief personal interview with the company accountant who prepares the quarterly report for his plant would also be useful in discovering the nature of his departures, if any, from the uniform accounting manual and reporting instructions. It is apparent from the reports that essentially uniform procedures are followed by company accountants, yet the manual and reporting instructions, even when followed conscientiously, permit some discretion in interpretation. Resulting differences in the reports may be fully justified by conditions peculiar to the reporting company. Knowledge of these conditions would be advantageous to the researcher in his analysis.

Another limitation is that the researcher has only partial control over the selection of the plants included in his study. Under terms of the contract between the Department and the accounting firm the Department must accept all reports submitted by the firm provided that they meet certain general requirements as to size of plant and location. Furthermore, it is doubtful whether these requirements could be made more specific since the reports received by the Department are a byproduct of a private business venture. It would be unreasonable, if not impossible, to require the accounting firm to obtain specific companies as clients.

As a corollary to this limitation, the accounting firm cannot force a client to report regularly if it chooses not to take full advantage of the firm's services. The firm can only point out to such a client the losses to it of such lapses in reporting. Fortunately, for the firm and the Department, irregular reporting has not been a serious problem even though it has reduced somewhat the number of firms for which we have a continuous series of quarterly reports. Similarly, our lack of full control over the selection of the reporting companies has not been a serious disadvantage. Similar problems arise in use of alternative collection methods.

## Evaluation

The method of collecting data for an economics study of milk plant operations discussed here appears, on the whole, to have considerable merit. It is low in cost in relation to the types, quality, and quantity of data obtained, and in relation to the costs and results of other data-collection procedures. It is superior to alternative methods particularly with respect to providing a series of reports over an extended period for a relatively large sample of companies, providing data on a highly current basis, and supplying data for a large group of companies using essentially uniform accounting procedures.

Although the method has a number of definite limitations, some of these might be removed in the future. For example, under a new contract with the accounting firm, if one should be negotiated, it might be possible to obtain more data on the physical characteristics of the plant, its buildings, and its equipment. Such information probably would not be needed each calendar quarter. An initial detailed description, supplemented by reports of later changes, if any, would be adequate.

It might also be possible to arrange for at least one personal visit by the researchers to each reporting company.

Finally, it might be asked whether this method could be used by a State agricultural experiment station. At present the answer is a qualified "yes." This method is similar in principle to methods long used by agricultural experiment stations and extension services in obtaining individual farm-accounting records. There are many practical difficulties to establishing a successful reporting system for agricultural processing and marketing firms, but the task does not appear to be an impossible one. However, for State experiment stations the savings in costs probably would not be as large as for the Department. The number of plants for which data are needed is less in a State than in a National study. Also, travel time and expenses are not so large in a State as in a National study.

# Book Reviews

*George N. Peek and the Fight for Farm Parity.* By GILBERT C. FITE. University of Oklahoma Press, Norman. 314 pages. 1954. $4.00

IN THIS, his second biographical study of agricultural leaders who fought the battle of equality for agriculture during the 1920's, Gilbert Fite has uncovered much new and detailed material on the intricacies of both the pressure and the party politics of the period.

Mr. Fite's biography of Peter Norbeck, published in 1948, was primarily devoted to politics within the State of South Dakota. The earlier book provided valuable insight into counter pressures at work within the farm bloc which limited its effectiveness in the fight for McNary-Haugenism; it contributed new material on the early development of the domestic allotment plan.

Mr. Fite's choice of George N. Peek as the subject of his second biographical study is a particularly fortunate one, for Peek was the most militant and resourceful of the farm leaders of the 1920's who popularized and fought for the principle that the Federal Government had the responsibility for helping farmers to achieve equality of purchasing power with other groups. As executives in the Moline Plow Company, Peek and General Hugh Johnson turned their attention to finding a solution for the farm surplus problem in the early twenties because, as Peek said, "you can't sell a plow to a busted customer."

The plan that Peek popularized and played a major role in developing was based on the idea of making the tariff effective for agriculture by segregating the exportable surplus from the part of the crop that was domestically consumed. By this means farmers were to receive a fair ratio price, or the domestic price plus the tariff, for that portion of the crop domestically consumed, and the world price for that portion sold on the world market. This 2-price plan was incorporated into the McNary-Haugen Bill which was before Congress from 1924 through 1928 and was twice vetoed by President Coolidge.

The plan developed by Peek and others and the several versions of the McNary-Haugen bills have been described and analyzed in a number of previous publications. Mr. Fite's contribution is in detailing the relationships between changes and compromises in the original plan and the necessity

for securing support from various types of farm and other pressure groups. The author outlines clearly, for the first time, changes in position by major farm organizations and other groups, and by prominent individuals during 1921 through 1928. Mr. Fite distinguishes between nominal and active support for the plan and lists some of the major financial contributions and contributors.

The author stresses the major contribution made by Peek to the acceptance of the parity concept by his single-minded devotion to the cause and his qualities of leadership. But he does not minimize Peek's failure "to take into consideration the overall complexity of economic conditions both national and international" and his inability to adapt his ideas to changes in agriculture and economic life which had taken place by the thirties and early forties. Peek remained an economic nationalist to the last and continued to advocate in 1943 about the same method for dealing with farm-surplus problems that he had promoted in 1923.

The author classifies Peek as an action man who was single-minded. Accordingly, Peek "did not see all of the economic relationships or show much interest in all of the intellectual excursions which a professional economist might want to consider. Part of his economic argument was weak, because he failed to take into consideration the overall complexity of economic conditions, both national and international."

Mr. Fite has provided an objective, accurate, and interesting account based on meticulous research into public and private files of Peek and other principals in the struggle for farm parity. This book will prove of interest and value to historians, economists, and others who are concerned with the political and economic background of current agricultural price support programs and proposals.

***Gladys L. Baker***

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*Irrigation Development and Public Water Policy.* By Roy E. Huffman. The Ronald Press Company, New York. 336 pages. 1953. $6.50

THE MANY AND VARIED FACTORS that influence water resources policy and irrigation developments are comprehensively reviewed in this text. The author recognizes that an understanding of historical, institutional, and political aspects, along with economic and social considerations, is essential for enlightened decisions on public water policy, and the analysis accordingly covers a wide range of irrigation issues and problems. The general approach used is to present an impartial interpretation of relevant elements, reserving the last chapter for a definite statement of the author's own conclusions. Throughout the text, extensive quotations are drawn from the works of others, with the author's commentary usually taking the form of an explanation or summary of pertinent considerations.

The topics discussed in the chapters may be grouped into four general categories. The first five are devoted to a summary of experience with irrigation legislation and development, and the extent to which such experience has become embedded in prevailing water rights and land regulations.

Attention in the next group of chapters centers on a series of interrelated problems that arise in connection with the establishment and operation of present-day irrigation projects and programs. Included are chapters on project organization, financing, land development, and integrated use of irrigated land.

A third group of chapters deals with irrigation within the framework of comprehensive resource development programs. There are chapters on river basin development, public interest in water resources, economic evaluation and feasibility, and irrigation in humid areas. With the possible exception of the discussion on public interest, the chapters in this group are particularly effective in clarifying many of the problems involved. The treatment of public interest leaves the issue rather nebulous.

The final group of chapters covers the major elements to be considered in formulating a con-

sistent water resource policy. The topics discussed are irrigation development in relation to population and food requirements, long-term national and foreign policy, and, finally, a chapter on the elements considered essential for a sound public water policy.

The conclusions and recommendations on water policy given in the final chapter are generally consistent with those contained in the reports of the Water Policy Commission and the Missouri Basin Survey Commission. Considerable attention is devoted to the composition of public water policy, but the discussion of organizational arrangements for its effectuation is limited.

The book has a number of features that deserve special commendation. Attention centers on essential issues and the discussion is well balanced. The presentation is clear and concise, so that the views expressed are likely to be readily understood by most readers. The documentation is extensive and thorough. Dr. Huffman's analysis makes a real contribution to a fuller understanding of the problems and issues that concern resource development; it deserves considered reading both as a college text and as a guide to analysts, policy-makers, and administrators of Federal and State resource programs.

*Mark M. Regan*

*American Geography: Inventory and Prospect.* Edited by Preston E. James and Clarence F. Jones. Published for the Association of American Geographers by Syracuse University Press, New York. 590 pages. 1954. $6.00

AMERICAN GEOGRAPHY: INVENTORY AND PROSPECT is a cooperative contribution of several geographers organized under the sponsorship of the Association of American Geographers to commemorate its fiftieth anniversary this year. The volume attempts to answer such frequently asked questions as "What is geography?" and "What do geographers do?"

Invited readers include workers in related disciplines who want to know more about the objectives, concepts, and methods of geographic research. A special invitation to agricultural economists seems appropriate because their field of activity is in many ways closely related to that of the geographer. The economist who has worked with a problem involving the factor of location or the investigation "of conditions peculiar to specific locations" is already familiar with the distinctive orientation of geography, which is "concerned with the arrangement of things on the face of the earth, and with the associations of things that give character to particular places." The map which is the basic tool of analysis of the geographer is well known to the economist and often serves him well.

This book is especially appropriate reading for workers in related fields of research who still associate geography with the concept of environmental determinism. Most geographers today no longer consider the concept useful.

Separate chapters written by well-known geographers, which were coordinated and edited under the guidance of a committee on American geography, present an interpretative résumé of developments and contributions in the different specialized segments of geography during the last 50 years. The scope of geographers' interests that parallel those of agricultural economists is indicated by such chapter titles as: "The Geography of Resources," "The Field of Economic Geography," "Agricultural Geography," "Transportation Geography," "The Geographic Study of Soils," and "The Geographic Study of Water on the Land." Several of the other chapters, including those on "The Regional Concept and the Regional Method," "Field Techniques," and the "Interpretation of Air Photographs," also have application in the field of the agricultural economist.

Anyone who is confronted with the need to present and analyze data by areas will find the discussion of the regional concept and the regional method particularly helpful. The geographers' approach is also illustrated in such discussions as those on the presentation of marketing data, market evaluation, delineation of trading and selling

areas, and transportation rates. Other examples include the contribution of the geographer to the classification of land, mapping of population and analysis of population trends, and the study of patterns of settlement.

The broad sweep of the volume necessarily limits the space given any specific segment of the field, but compensation for this abbreviated treatment may be found in the selected bibliographies at the end of each chapter. More than 1,300 items are contained in these topically arranged references. They include many examples of research being carried on by geographers as well as the major methodological writings pertaining to the different areas of geographical investigation.

Although the major emphasis of the book is on "inventory" of American geography, "prospect" is not altogether neglected. There is an implication that geography can be made a more practical subject in the future than it has been in the past and that geographers have many new opportunities in their field of study. The book acknowledges several important needs that concern not only geographers but workers in related areas of research. It invites more effective criticism for geographic work carried on by both professional geographers and "those persons in other disciplines who undertake research of geographic quality." It expresses need "for more cooperative work by teams of scholars with different areal and topical specialties." Lastly, the book gives implicit recognition of the fact that if geographers "are to make their most effective contribution to geography, they must adhere to the geographic point of view and practice incontrovertible geographic methods."

*James R. Anderson*

## Selected Recent Research Publications in Agricultural Economics Issued by the United States Department of Agriculture and Cooperatively by the State Colleges [1]

BOTTS, RALPH R. AMORTIZATION OF LOANS. ITS APPLICATION TO FARM PROBLEMS. 20 pp. Agr. Res. Serv. May 1954. (Processed.)

Discusses briefly how amortization can be used to advantage by both borrowers and lenders and shows mechanics of preparing an amortization table.

BREAKIRON, P. L., WINSTON, J. R., and KAUFMAN, J. STUDIES OF WATERMELON LOADING FOR RAIL SHIPMENT, 1953. U. S. Dept. Agr. Mktg. Res. Rept. 62, 27 pp., illus. May 1954. (RMA)

Loading Congo melons crosswise of the car instead of lengthwise resulted in 70 percent less bruising, 69 percent fewer cracked melons, and 47 percent less surface scarring than in comparable shipments loaded lengthwise.

BREWSTER, JOHN M. COMPARATIVE ECONOMIES OF DIFFERENT TYPES OF COTTONSEED OIL MILLS AND THEIR EFFECTS ON OIL SUPPLIES, PRICES, AND RETURNS TO GROWERS. U. S. Dept. Agr. Mktg. Res. Rept. 54, 239 pp., illus. February 1954. (RMA)

As a general rule, the prepress-solvent process ranked first in profitability, the direct-solvent process second, the screw-press process third, and the hydraulic process last.

BRINEGAR, GEORGE K., and JOHNSON, STEWART. THE MARKET FOR FLUID SKIM MILK. Conn. (Storrs) Agr. Expt. Sta. Bull. 303, 43 pp., illus. July 1953. (RMA)

Sales of fluid skim milk have decreased in the last 5 years. Findings indicate that skim milk tends to be overpriced in comparison with whole milk.

DREWNIAK, EDWIN E., HOWE, MILTON A., JR., GORESLINE, HARRY E., and BAUSH, EDWARD R. STUDIES ON SANITIZING METHODS FOR USE IN POULTRY PROCESSING. U. S. Dept. Agr. Cir. 930, 30 pp., illus. March 1954. (RMA)

Five sanitizing methods were studied to learn their effectiveness in decreasing bacteria on equipment and poultry during processing. In-plant chlorination at 10, 20, and 45 p. p. m. concentrations in processing water was exceptionally effective.

[1] Processed reports are indicated as such. All others are printed. State publications may be obtained from the issuing agencies of the respective States.

FENZAU, C. J., and VAN ARSDALL, R. N. MEETING DAIRY MARKET SANITATION REQUIREMENTS ECONOMICALLY. A PRELIMINARY REPORT. U. S. Dept. Agr. Mktg. Res. Rept. 64, 26 pp., illus. May 1954. (RMA)

Study shows that, with good practices, milk of consistently high quality can be produced with a relatively low investment in buildings, and with less labor than commonly used. New dairy buildings and equipment for herds of 20 to 30 cows were provided for an investment at 1950 prices of about $200 per cow.

FOX, KARL A., and COONEY, JAMES F., JR. EFFECTS OF INTERCORRELATION UPON MULTIPLE CORRELATION AND REGRESSION MEASURES. 28 pp. Agr. Mktg. Serv. April 1954. (Processed.)

With given values for $r_{12}$ and $r_{13}$ and a specified size of sample, all of the correlation measures in a three-variable problem can be expressed simply as functions of $r_{23}$. In the four-variable case six simple correlation coefficients are involved, but the same approach can be used by specifying five of these and allowing the sixth one ($r_{34}$) to vary over its entire range of possible values.

FRICK, G. E., WEEKS, S. B., and FELLOWS, I. F. PRODUCTION EFFICIENCY ON NEW ENGLAND DAIRY FARMS. IV. ADJUSTMENTS IN THE ORGANIZATION OF MACHINERY AND EQUIPMENT. N. H. Agr. Expt. Sta. Bull. 407, 39 pp. May 1954. (Storrs (Conn.) Agr. Expt. Sta. and Agr. Res. Serv. cooperating.)

Greater mechanization is contributing to the trend in specialization on New England dairy farms through the rise of custom services for many operations. Hiring certain jobs custom-performed often reduces costs and frees capital and labor for use in producing more milk.

GAUGER, LOUIS KAYE, MUEHLBEIER, JOHN, and KRISTJANSON, KRIS. LAND SALES AND ASSESSED VALUES IN NEBRASKA, 1930–52. Nebr. Agr. Expt. Sta. Misc. Pub. 3, 23 pp., illus. January 1954.

The purpose of this report is to show the trend in prices of farmland from 1930 to 1952, to show the relationship between prices and assessed values, and to compare land prices and number of transfers based on actual sales.

GIBSON, W. L., JR., and ELLIS, HAROLD H. INHERITANCE—YOUR FARM AND FAMILY. Southern Farm Management Ext. Pub. No. 5, 27 pp., illus. November 1953. (Sponsored by Agr. Ext. Serv. of Ala., Ark., Fla., Ga., La., Miss., N. C., Okla., S. C., Tenn., Texas, and Va.; Farm Foundation and U. S. Dept. Agr. cooperating.)

Discusses objectives, methods, and problems in the inheritance of property and answers some of the questions which farmers frequently ask.

GOULD, WILBUR A., DAVIS, REES B., MAVIS, JAMES O., KRANTZ, FRED, JR., and HEALY, NORMAN C. A STUDY OF THE RELATIONSHIP OF VARIOUS GRADES OF FRESH AND CANNED VEGETABLES. II—CANNED TOMATO JUICE. 65 pp. Ohio Agr. Expt. Sta., Wooster, Ohio, Dept. of Hort. Mimeog. Series No. 55. January 1954. (RMA) (Processed.)

On the basis of this study, it is concluded that the grade relationship between the raw product and the finished product is better when the variety, process, season, and objective color evaluation of the raw product are considered.

HERMIE, ALBERT M. PRICES OF WOOL AT BOSTON. A COMPARISON OF PRICES OF DOMESTIC AND IMPORTED WOOLS. U. S. Dept. Agr. Agr. Inform. Bull. 118, 41 pp., illus. January 1954.

Wool is one of the most difficult commodities to classify and grade uniformly. It varies greatly not only from one breed of sheep to another, but also from fleece to fleece and from one part to another of the same fleece. It is classified by the trade principally on the basis of grade and staple. Official U. S. standards apply only to grade of fiber, each grade representing a range of fineness. Prices of wools in the grease are quoted on a grease basis, clean basis, or both. Clean-basis prices are usually quoted on the Boston market in terms of American yield.

HERRMANN, LOUIS F. INDIRECT ESTIMATES OF THE SOLIDS-NOT-FAT CONTENT OF MILK. THE BASIS FOR, AND HISTORY OF, PUBLISHED METHODS AND EQUATIONS. 44 pp. Agr. Mktg. Serv. March 1954. (RMA) (Processed.)

More than 70 formulas for estimating solids-not-fat are given in the literature. The formulas are derived algebraically from two basic equations, which are linear. Evidence suggests that a nonlinear function gives a closer representation of the relationships.

JOHNSON, THEW D. WHOLESALE PRODUCE MARKETS OF SAN DIEGO, CALIF. 30 pp., illus. Agr. Mktg. Serv. May 1954. (RMA) (Processed.)

Facilities and methods used in handling fresh fruits, vegetables, poultry, eggs, meats, dry groceries, and related food products at wholesale in San Diego were studied, and a layout for a wholesale food market center was made.

KROMER, GEORGE W., and GILLILAND, C. B. PROCESSING THE THREE MAJOR OILSEEDS. U. S. Dept. Agr. Mktg. Res. Rept. 58, 37 pp., illus. April 1954. (RMA)

In the 1951–52 season, the direct-solvent method was used for processing 74 percent of the soybean crush; the hydraulic-press was used for 57 percent of the cottonseed crush; and the screw-press method accounted for 16 million bushels of the 30 million bushels of flaxseed processed.

NORTH CENTRAL FARM MANAGEMENT RESEARCH COMMITTEE. ECONOMICS OF SOME SOIL CONSERVATION PRACTICES. Iowa Agr. Expt. Sta. Research Bull. 403, pp. 573–612, illus. December 1953. (BAE and SCS cooperating.)

Among the practices discussed are contour cultivation, strip cropping and terracing, use of grass waterways, mulch tillage and its various ramifications, improvement of drainage, and supplemental irrigation.

NORTH CENTRAL REGIONAL COMMITTEE ON DAIRY MARKETING RESEARCH. OUTER-MARKET DISTRI-

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BUTION OF MILK IN PAPER CONTAINERS IN THE NORTH CENTRAL REGION. Purdue University Agr. Expt. Sta., Station Bull. 600, 44 pp., illus. North Central Regional Pub. 39. October 1953. (Agr. Expt. Stas. Ill., Ind., Iowa, Kans., Ky., Mich., Minn., Mo., Nebr., N. Dak., Ohio, S. Dak., and Wis., and BAE cooperating.)

The volume of paper-packaged milk distributed outside local markets by operators of the 588 plants studied was equivalent to 12 percent of all bottled and packaged milk distributed in the region.

ROHRER, WAYNE C., and MOTHERAL, JOE R. LABOR USE IN THE EASTERN SHORE TRUCK CROP HARVEST. Md. Agr. Expt. Sta., Misc. Pub. 174, 34 pp. November 1953.

Forty-five percent of the harvest labor force on truck-crop farms surveyed consisted of migratory workers; 46 percent were individuals hired locally, and the rest was made up of regular hired workers, family workers, local crews, and neighbors.

RUSH, JOHN D. LEGAL LIABILITY RISKS AND INSURANCE PROTECTION FOR FARMERS. U. S. Dept. Agr. Agr. Inform. Bull. 122, 38 pp. April 1954.

Liability insurance is more necessary to a farmer now than ever before. This report discusses the types of liability insurance a farmer may carry, together with court cases selected to emphasize situations that require his special attention.

RUTTAN, VERNON W. TECHNOLOGICAL PROGRESS IN THE MEAT-PACKING INDUSTRY, 1919–47. U. S. Dept. Agr. Mktg. Res. Rept. 59, 38 pp., illus. January 1954. (RMA)

Computations based on the net input-output approach indicate that the input required by the industry to produce a given output probably fell about 25 percent from 1919 to 1947.

SHEPHERD, J. B., WISEMAN, H. G., ELY, R. E., MELIN, C. G., SWEETMAN, W. J., GORDON, C. H., SCHOENLEBER, L. G., WAGNER, R. E., CAMPBELL, L. E., ROANE, G. D., and HOSTERMAN, W. H. EXPERIMENTS IN HARVESTING AND PRESERVING ALFALFA FOR DAIRY CATTLE FEED. U. S. Dept. Agr. Tech. Bull. 1079, 147 pp., illus. February 1954.

More than 90 percent of the hay crop is harvested as field-cured hay, 3 to 5 percent as grass silage, 1 to 2 percent as barn-dried hay, and 1 percent as dehydrated hay or meal. From 1945 to 1949 experiments were conducted to provide information regarding the relative merits of these four methods of harvesting.

SMITH, HAROLD D. EFFECT OF MERCHANDISING SCHOOLS ON THE RETAIL PRACTICES AND SALES OF POULTRY AND EGGS. Md. Agr. Expt. Sta. Bull. 447, 31 pp., illus. January 1954. (RMA)

Of the 53 stores that sent trainees to the retail merchandising schools, 26 made changes in their handling practices. The dollar value of sales of poultry products increased an average of $55.48 per store in one week for stores that had trainees and made changes; whereas the increase was only $2.33 per store for those who had no trainees and made no changes.

SPILSBURY, CALVIN C. PROCESSING COSTS OF SOYBEAN-OIL MILLS, 1951–52 AND 1952–53. 15 pp. Agr. Mktg. Serv. May 1954. (RMA) (Processed.)

During 1952–53 the total cost of processing soybeans averaged 37.6 cents a bushel at solvent-extraction plants and 32.8 cents at screw-press mills. During 1951–52, total cost averaged 36.5 cents and 34.4 cents, respectively.

STROBEL, D. R., BRYAN, W. G., and BABCOCK, C. J. BUTTER OIL. A REVIEW OF LITERATURE. I. FOOD PRODUCT OF THE UNITED STATES. II. GHEE—FOOD PRODUCT OF THE MIDDLE EAST. 22 pp. Agr. Mktg. Serv. March 1954. (Processed.)

As a result of the butter situation, interest in butter oil has been renewed. This report reviews the research on manufacture, use, storage life, and related aspects of butter oil. Reports regarding the manufacture, taste, nutritive value, and storage life of ghee, a product similar to butter oil, are also reviewed.

TAYLOR, C. C., and AULL, G. H. PROPERTY TAX PROBLEMS IN THE SOUTHEAST. S. C. Agr. Expt. Sta. Bull. 414, 26 pp. January 1954. (Agr. Expt. Stas. of Ala., Fla., Ga., N. C., S. C., Tenn., and Va., and Agr. Res. Serv. cooperating.) (Pub. No. 11, Southeast Regional Land Tenure Committee).

An investigation of property tax administration in the Southeast revealed major problems which these seven States have in common. The property tax structure is complicated by many governmental subdivisions; the assessment system is apparently responsible for many of the difficulties of administering the property tax; and many statutory provisions appear to be unnecessarily complex.

THORFINNSON, T. S., and EPP, A. W. EFFECT OF PUMP IRRIGATION ON FARMS IN CENTRAL NEBRASKA. Nebr. Agr. Expt. Sta. Bull. 421, 32 pp., illus. October 1953.

Prominent among the effects of irrigation was the realization of deficiencies in soil fertility, principally nitrogen. As a result the acreage of legumes grown and the quantity of commercial fertilizer used were increased. Crop yields under irrigation were considerably higher than yields on dry land.

VOORHIES, EDWIN C. TRADE IN WESTERN LIVESTOCK AT AUCTIONS. 3. SOME FACTORS AFFECTING PRODUCERS' CHOICE OF MARKETING AGENCIES. A Western Regional Research Publication. Calif. Agr. Expt. Sta., Bull. 740, 67 pp., illus. April 1954. (RMA) (Agr. Expt. Stas. of Ariz., Calif., Colo., Hawaii, Idaho, Mont., Nev., N. Mex., Oreg., Texas, Utah, Wash., and Wyo.)

In suggesting ways of improving livestock marketing, western ranchers and farmers emphasized the need for improved transportation, more cooperative selling, more local markets, and more competition.

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